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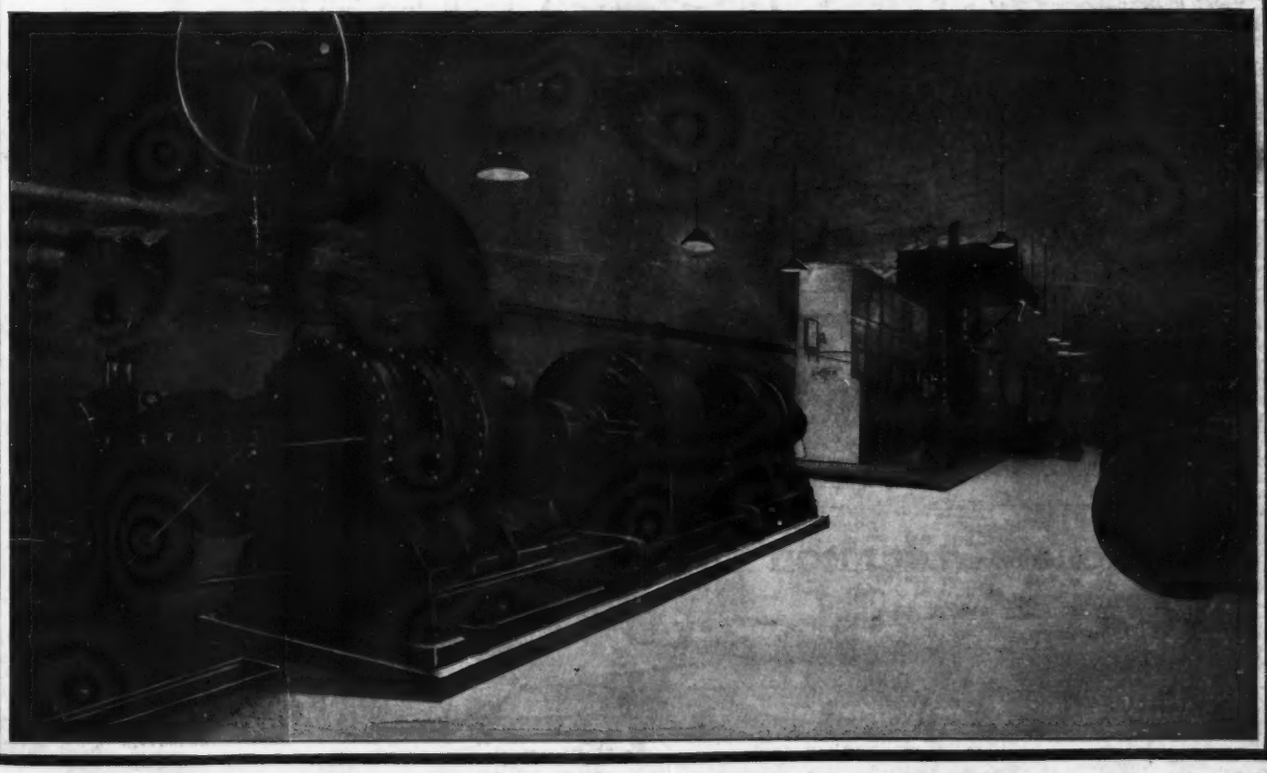

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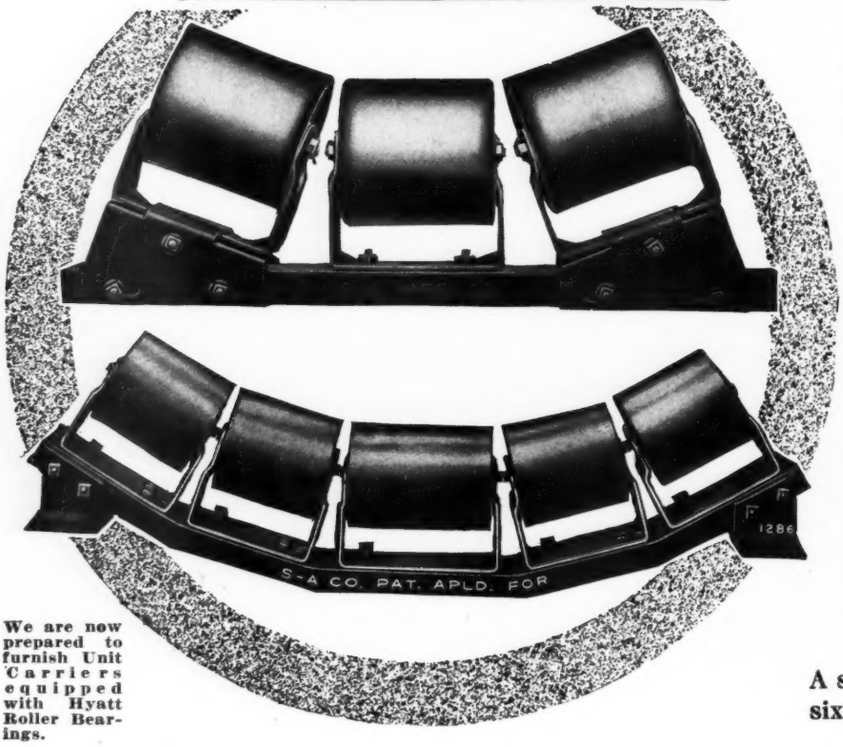

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Engineering and Mining Journal

VOLUME 104 SEPTEMBER 29, 1917 NUMBER 13

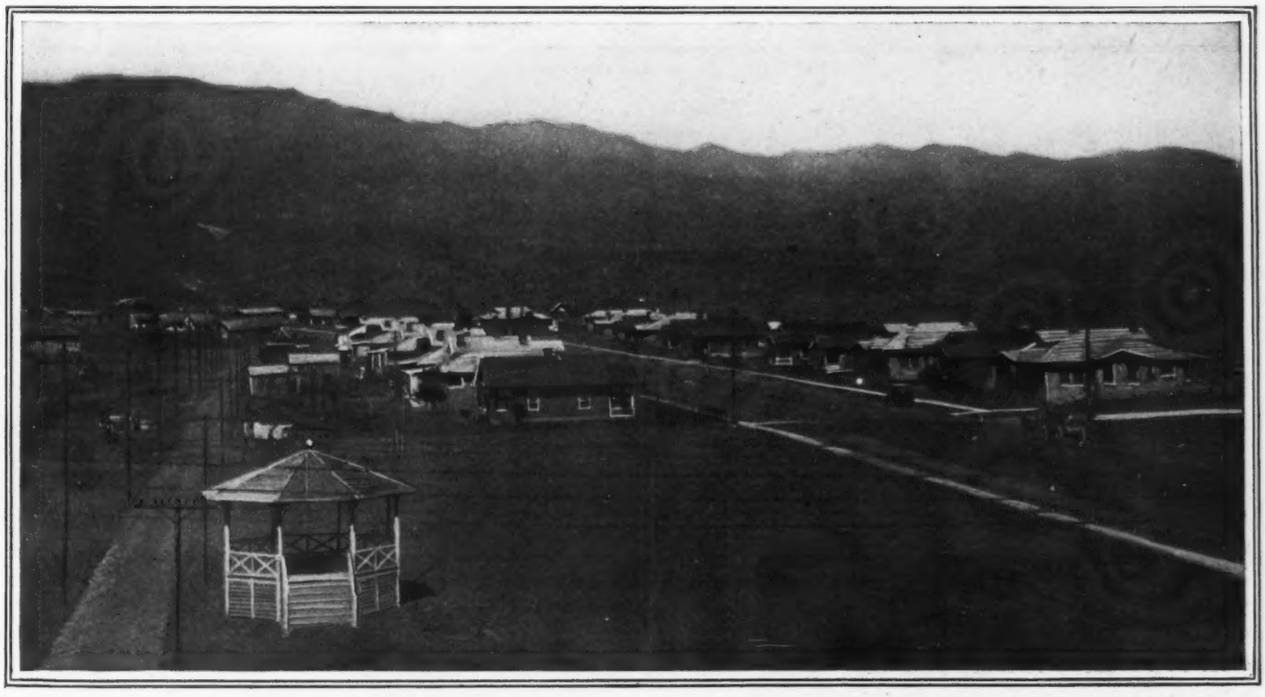
Clarkdale, Arizona, United Verde's Million Dollar Town

By T. C. ROBERTS
Chief Engineer, United Verde Copper Co., Clarkdale, Ariz.

A modern company town, built according to the employees' tastes and up to date in sanitation and modern equipment. Floor-plan designs are given with photographs of the various standard houses; also some approximate cost data.

WHEN the United Verde Copper Co. decided to build its new smelting plant the company was confronted with the problem of providing dwellings for its employees. After considerable preliminary work had already been done the problem was placed in my hands. It was decided to build a town to take care ultimately of seven thousand inhabitants. The new town was to be named Clarkdale in honor of ex-Senator W. A. Clark, the principal owner of the United Verde mine. Jerome, the nearest town, was about six miles away, and there were no railroad connections between the two town sites. After considering the problem in all its phases President W. A. Clark decided that the company would build a model town; that it would be different in construction from the usual company-built towns in that all the buildings would not be of the same design; and that they would be built entirely of brick.

In order to get the individual's ideas on design, all employees who were to live in Clarkdale were requested to submit a rough sketch showing what they would desire if they were building their own homes. From these sketches a number of standard houses were planned containing from one to nine rooms. A number of special houses were also designed to meet the requirements of employees whose ideas could not be satisfied with the more modest constructions. Suitable clay beds having been found in the vicinity, a brick plant and a sand-and-gravel washery were first constructed.



VIEW OF THE UPPER TOWN, CLARKDALE, ARIZ.

The town is laid out in two districts, known, respectively, as the upper town and the lower town. In the upper town are all public and mercantile buildings and residences for merchants, professional men or any of the employees desiring that locality. In the lower town, which is nearer the smeltery, residences were built for

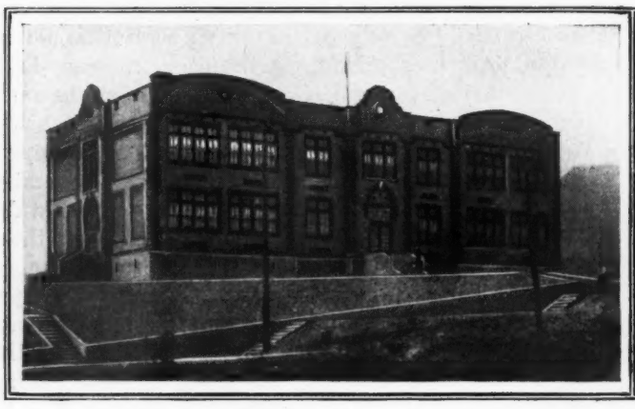
all employees who preferred that section. The lots in the upper town are 32 x 120 ft. and in the lower town they are 30 x 90 ft. The streets are 40 ft. wide between curb lines and 60 ft. wide between building lines, allowing 10 ft. on each side for sidewalk, parking, etc. A 10-ft. lane or alley divides the block and gives access to the rear of all buildings.

The principal thoroughfare on which the business houses are situated is Main Street, which is 55 ft. between curbs and 75 ft. between buildings. The streets parallel to Main Street are designated as First, Second and Third North Streets, etc., and First, Second, Third and Fourth South Streets, etc. The cross streets are numbered from First Street to Seventeenth Street, inclusive. The residences, which will be described more or less in detail, are situated on alternate lots, thereby leaving greater space between them, avoiding a crowded effect and making it more pleasant. Ornamental iron fences were built around each house.

Due to the excessive heat in summer, a number of houses of the Mexican patio type were built. Each patio is 110 ft. long x 32 ft. wide, and contains five two-room apartments under one roof. The exterior walls, 8½ in. thick, are constructed of brick, the foundation and floor being of concrete. Each apartment has a living room 11 ft. 3½ in. by 12 ft. 5 in., and a combination dining room and kitchen of the same dimensions. There is also a sleeping porch with shower-bath and toilet accommodations. Separating each apartment is the yard, or patio, from which this style of house gets its name. The space between the apartments is 10 ft. wide and 32 ft. long, closed at each end with latticework and gates. These houses have a pleasing appearance and cost approximately $2300 each.

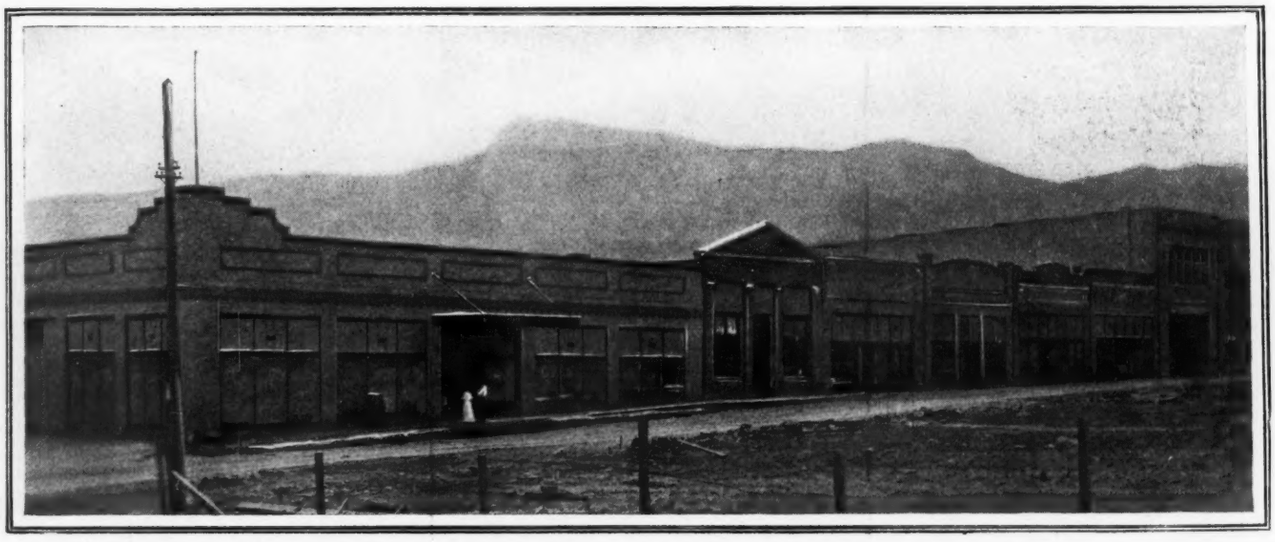
The residences built in the lower-town site consist of two-, three- and four-room single, and two-room double, cottages. To date, there have been erected twenty three-room houses costing $1600 each; forty-five four-room houses costing $1250; and eighteen double two-room houses costing $2225. These cottages are constructed with brick exterior walls 8½ in. thick, concrete foundations and timber joists and partitions. A number of these buildings have composition-roof coverings, some have asbestos roofs, and some stained cedar shingles. The walls inside received two coats of plaster and a sand finish.

The residences erected on the upper-town site consist of forty-six four-room cottages costing $1700 each and twenty five-room cottages costing $2600 each. They are of the same construction as the lower-town-site houses. The five-room cottages have hard-wood floors in living and dining rooms. These rooms are divided by large arches, supported on two columns. The upper-town-site houses have a front porch and at the rear a sleeping porch. The styles are bungalow, with gabled shingle roofs stained in red and green colors. The brick selected



TWO-STORY SCHOOLHOUSE

RESTAURANT AND ROOMING HOUSE

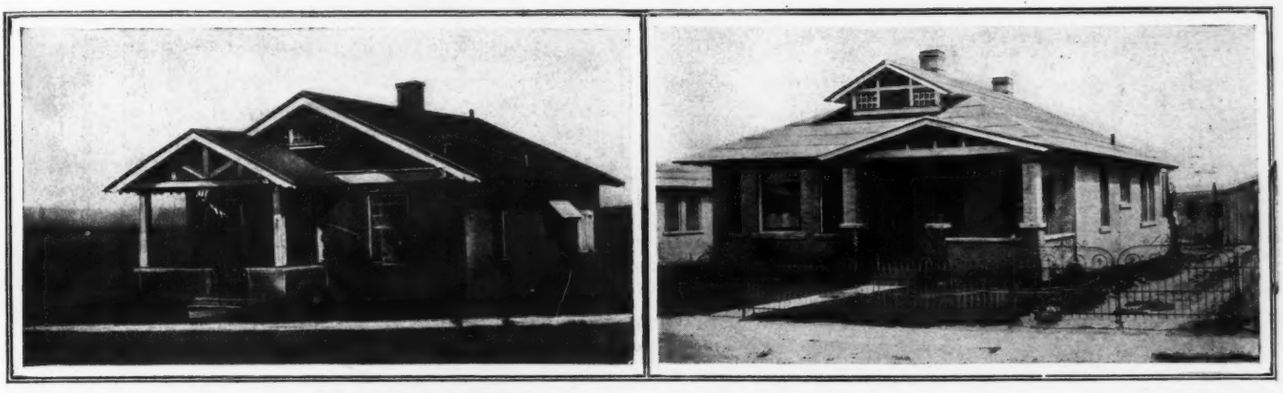


A BUSINESS BLOCK IN THE CENTER OF CLARKDALE, ARIZ.

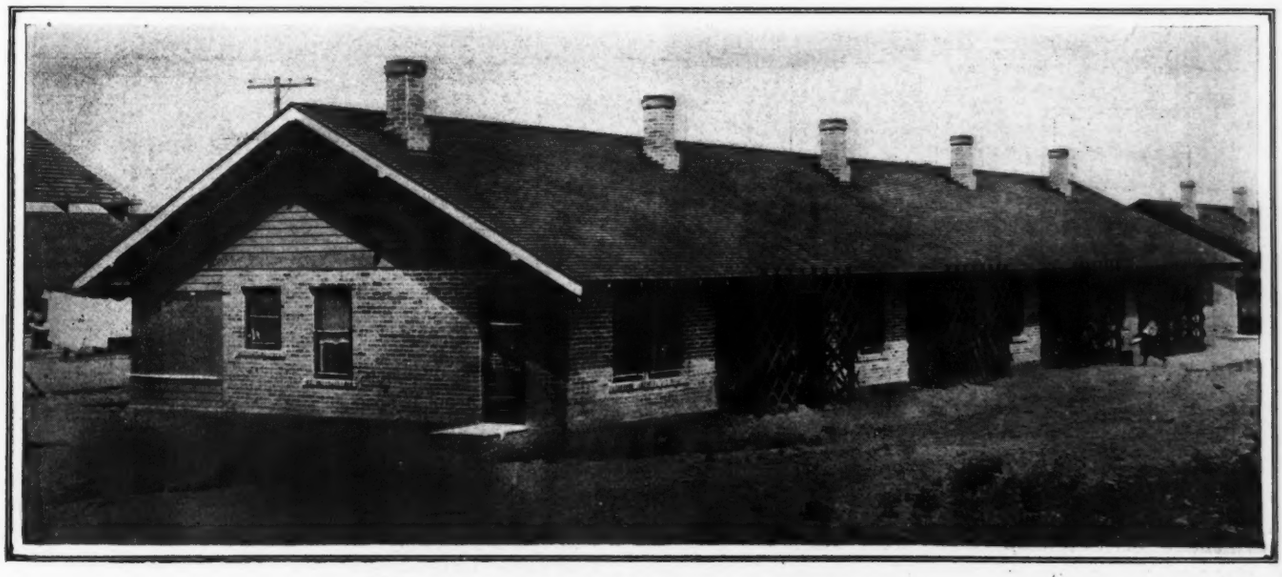
for the exterior walls are of different colors in different buildings, giving a harmonious tone throughout. In addition to these houses, as stated before, a number of special houses were built, costing from $3000 to $10,000 each.

The schoolhouse is two stories in height. The foundations are of concrete; the beams supporting the first-floor joists are of reinforced concrete; the frame consists of steel beams and columns, and the exterior curtain walls of brick. The brick walls are 13 in. thick on the first floor, the piers being carried up to the roof beams at a uniform thickness. The walls between the piers in the second story are 9 in. thick. This building is 111 ft. long x 61 ft. 3 in. wide and contains nine class rooms, a library, a room for the principal, a rest room for teachers, and an auditorium with stage for recitals, etc. The size of the class rooms is 24 x 30 ft., and the auditorium 36 x 48 ft. exclusive of the stage. The heating has been taken care of by a steam plant and the ventilating by a plenum system. This building cost approximately $60,000. The exterior is of light buff brick with dark mortar joints, and trimmings in cement. The blackboards are of slate. The building is equipped with electric clock and program signal systems. The furnishings are of latest type throughout. The natural light, in order to avoid cross lights, is admitted from one side only of each room.

The policy adopted in deciding upon the design for business houses was as follows: Notice was given to the public that applications would be accepted from those desiring to engage in business in Clarkdale. When the applications were all received each was carefully considered. It had been previously decided how many shops of the same class would be permitted, due consideration having been given to the effect of excessive competition. Each successful applicant was invited to present a rough sketch showing the size of the building that he would require. The buildings were then designed according to the individual's requirements and were grouped according to class of business but also with regard to scenic effect. By building lodge rooms and offices on top of what would otherwise be one-story shops, the buildings are made nearly uniform in height although varying in design. The construction consists of brick walls, steel beams and girders, and fire walls. All of the fronts are glazed with plate glass and equipped with ventilators. Clarkdale is not an incorporated town. It is not the desire of the company to receive any monetary profit from the town over the revenue required to cover insurance, maintenance, sanitary and policing expenses, therefore the rental both for business and residence buildings was based on a fixed percentage of the actual construction cost of the building. The class of business conducted in Clarkdale



FOUR-ROOM AND FIVE-ROOM COTTAGES, UPPER TOWN, CLARKDALE, ARIZ.

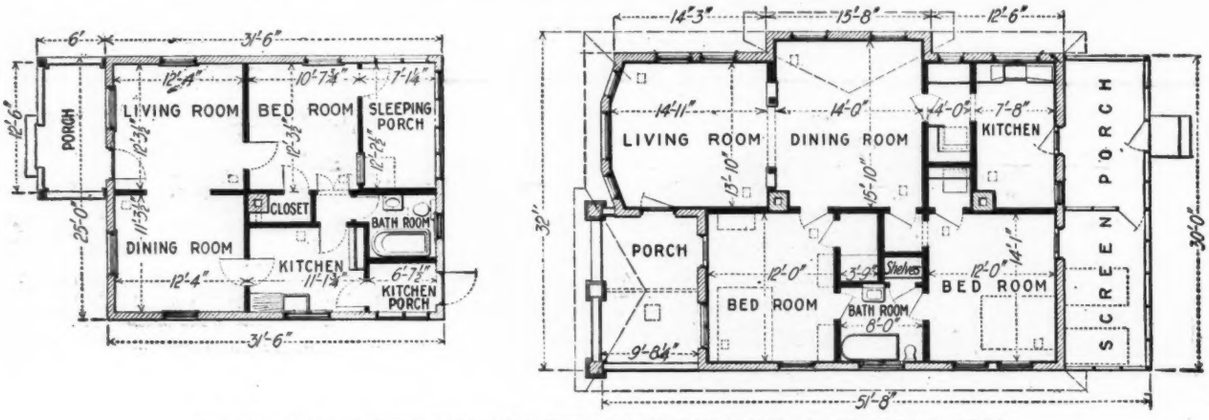


ROW OF APARTMENTS, MEXICAN PATIO STYLE

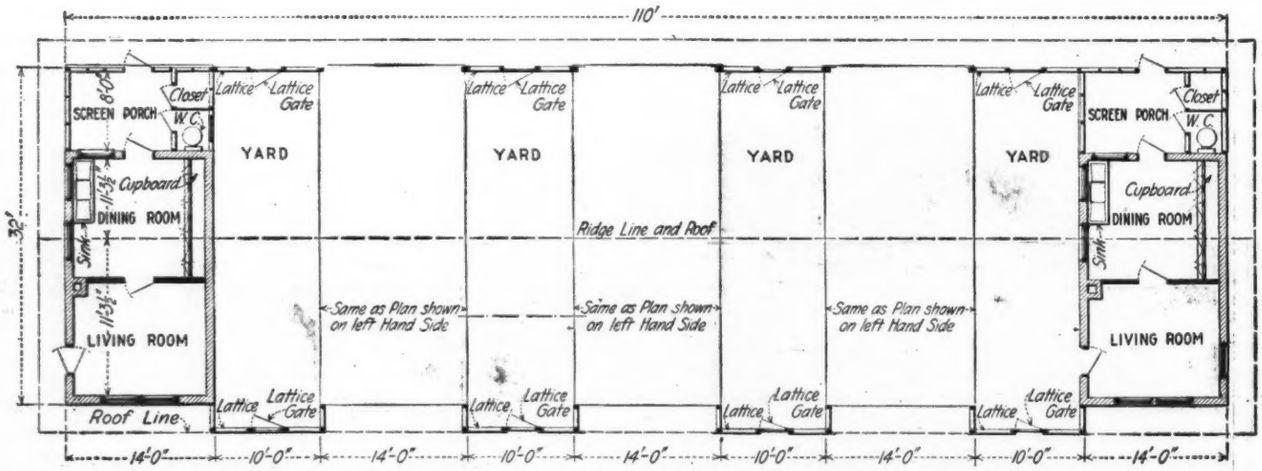
is the same as that in any other town, consisting of the same general stores, banks, post-office, drug stores, moving-picture theaters, bakeries, restaurants, lodge rooms, office buildings, etc. As stated before, due to the elimination of excessive competition, the merchants seem to be thriving, and conduct stores that would be a credit to many larger towns.

Restaurant and Rooming House in Lieu of Hotel

Due to the fact that satisfactory arrangements could not be made for a tenant for the hotel, a rooming house with a restaurant attached was built. This house contains 30 rooms. Exterior walls are of brick over which is a composition roof. The building cost approximately $15,000 and has screened sleeping porches on three sides.



FLOOR PLAN FOUR-ROOM AND FIVE-ROOM COTTAGES, CLARKDALE, ARIZ.



FLOOR PLAN OF ROW OF MEXICAN PATIO APARTMENTS

The electric-lighting system was designed and constructed in accordance with the Arizona Corporation Commission's rulings, which are based almost entirely upon the National Electric Light Association's standards. The Mountain States Telephone and Telegraph Co. serves the town under a special permit. The water supply is obtained and piped in from springs in the mountains to a reservoir built of reinforced cement, and has a capacity of 500,000 gal. It is then distributed through the town system which was constructed in accordance with standard practice. The sewerage system[1] consists of approximately 30,000 ft. of 6-, 8-, 10- and 12-in. mains with flush tanks installed where necessary, and discharges into a septic tank consisting of 14 compartments, 9 x 9 x 12 ft., and divided into two sections of seven compartments each. The capacity of each tank up to the affluent outlet is 769 cu.ft. The sludge capacity of the 14 tanks is approximately 9000 ft. The operation of the tanks, which are of a modified Imhoff design, is according to the usual practice. The sewage from the 12-in. main enters one bay of the tanks and the flow is changed from one bay to the other approximately every 3 months. The usual sludge and sand filter beds are built in connection with the tanks. The tanks cost approximately $15,000, and the entire system cost approximately $60,000. All the water, sewerage, lighting and power systems are controlled by the United Verde Copper Co., while the town of Clarkdale is controlled by the United Verde Copper Co. through the Clarkdale Improvement Co. The Verde Valley branch of the Santa Fe, Prescott & Phœnix R. R. connects Clarkdale with the main line, and in a short time the Verde Tunnel and Smelter R.R. will be extended to Jerome, giving connection over the United Verde & Pacific R.R. with the main line at Jerome Junction. The town cost approximately a million dollars.

[1] "Eng. and Min. Journ.," p. 584, Sept. 27, 1913.

Silver-Palladium-Cobalt Alloy has been patented by H. S. Hooper in U. S. Pat. 1,229,037. The alloy is described as consisting of 70% silver, 25% palladium and 5% cobalt. It is hard, heat-resisting, non-oxidizing and is a good conductor of electricity. These properties make such an alloy well adapted for use in electrical-contact points.

Standard Reports for Accident Statistics*

Three thousand lives are lost every year in the mines of the United States. Standardization of accident records and the use of information to be gained from statistics would reduce this mortality. Kind of data required for complete records and what the mine operator can do in this connection.

THE magnitude of the mining industry may be grasped when one realizes that more than 6,000,000 men are engaged in the mines of the world. Of this number 3,800,000 are employed in the coal mines and 2,200,000 in the metal mines. In addition, millions more are engaged in allied industries dependent directly upon the mines for coal and metal.

Mining is one of the hazardous industries employing over 1,000,000 men in the United States, in which three out of every 1000 men employed are killed every year by reason of some accident. While complete data relating to non-fatal injuries are not available, reports to the U. S. Bureau of Mines for all metal mines in the United States show that about 200 men per thousand per year are injured sufficiently to cause a loss of time. A reduction of 50% in the number of mine accidents would mean a saving of 1500 lives in the United States every year, in addition to reducing the loss of time and suffering resulting from more than 200,000 non-fatal injuries.

Why Accident Statistics Are Valuable

Before offering any suggestions as to what the operator can do for accident statistics, it is well to point out some of the reasons why accident statistics are desirable. The reason is not merely to show a record of experience, discomfort, pain and suffering of the employees to be handed down to future generations or to statisticians in order that a set of figures may be juggled to suit any peculiar whim; nor to provide for the construction of fancy charts. These things are, however, necessary adjuncts to the main purpose, viz., to obtain information by which a diagnosis of industrial accidents may be made, the causes determined, and remedies provided. Statistical records are absolutely essential as a matter of evidence to prove the guilt of certain mechanical devices which assault with intent to maim or kill, and to determine with a reasonable degree of accuracy the extent of the personal element entering into the cause of accidents. As in every court of justice, it is necessary to have all the evidence available in order to find the guilty one, and to pass proper sentences.

There are a few operators who have not awakened to the need of statistics and therefore feel, when asked for certain information concerning accidents to their employees, that a sort of inquisition is being forced upon them to disclose their private business. Far from it. Such information is for the operators' benefit as well as for the welfare of their employees. Whatever expense is incurred to help human beings in their work by providing conditions conducive to good health and bodily comfort will be returned by increased dividends to the man who provides such essentials. Sick or crippled employees in the hospital or at home are a burden to themselves and their families, to the community and the state, and are of no benefit whatsoever to their employers. Even though a crippled man may be employed as a pensioner, he cannot render full service to his employer.

Statistical reports should embody all of the information available concerning each accident, if the best results are to be obtained. It is not enough to know that a man fell down a shaft and was killed. Why did he fall down? Who was to blame? Was the shaft properly guarded? Could the accident have been avoided? The answers to these questions are what should be recorded in accident statistics.

What Operators Can Do

So long as accidents occur it is necessary for the operator to keep correct and detailed records. He should study intelligently every accident from all angles. If the accident was preventable, he should install a device that would prevent its reoccurrence. At the close of the year he should take an inventory of his accident records with the object of finding out what and who was to blame for each group. Having found out the principal causes, he should see that proper remedies are then applied. For example, should it be known that a certain type of machine has cut off a dozen fingers during the year, the remedy is not to supply additional fingers, but to devise a guard for the machine or install another type for this particular work.

If human beings were perfect and it were possible to devise perfect machinery, there would be no need for accident statistics. While someone has a lapse of memory for an instant, a machine that is under human control moves 3 in. too far and crushes a man to death. Another does not look where he is stepping and as a result falls down a shaft. The shaft should have been guarded to protect the thoughtless. Lead pencils have rubbers because people make mistakes. Industries have many accidents because of mistakes; many occur because of carelessness, and many because of inadequate mechanical safety devices. Mistakes are made by manager as well as by employee; both are often careless and both are responsible for mechanical equipment, the employer in providing it and the employee in keeping it in proper condition when installed and turned over to him to operate.

In all industries there are a certain number of accidents that are inherent and for which it is impossible to place the blame on anyone. Such accidents in the mining industry equal about 50% of the total. The responsibility for the remainder may be placed about equally on the operator and the employee as shown by the records of the mine inspectors of the Union of South Africa.

In order that the accident records of one company or one state may be comparable with those of others,

*A paper entitled, "What Can the Mine Operator Do To Aid Accident Statistics," presented by Albert H. Fay, mine statistician, U. S. Bureau of Mines, Washington, D. C., before the mining-section meeting of the sixth annual congress of the National Safety Council in New York, Sept. 13, 1917

they should be collected and tabulated on a uniform basis, care being taken to separate each branch of industry from all others. The number of men employed should be classified into underground and surface employees, and a corresponding grouping of fatal and nonfatal injuries should be made according to the principal causes. Uniformity may be brought about by the standardization of state laws relating to statistics. The Bureau of Mines is doing all in its power toward this end, a committee having drafted standard rules and regulations relating to metal mines. One relating to coal mines is under consideration. It is hoped that state legislatures will adopt, as nearly as conditions will permit, the rules and regulations proposed by the bureau. The operators can help in this.

Necessity for Exact Records

Exact records of labor are necessary and should include the number of men on the payroll; days and wages lost by reason of accidents, as well as days off duty for other causes. A classification of employees by occupation is desirable by reason of the varying occupational hazards. Inasmuch as all industrial plants do not have the same number of working hours per day or per year, it would assist very materially in the matter of comparing accident records and rates if the operators would keep record of the time actually worked by all employees. In other words, the plant which operates on the basis of a 10-hr. day should have a greater accident hazard than a similar one operating on an 8-hr. basis, and a comparison of the two without an adjustment is not fair to either the one or the other. The company's payroll in every case, except in contract labor, should show the number of hours for which wages are paid during the day, week, month or year. Taking the number of hours as a basis upon which to calculate the accident frequency, it is an easy matter to arrive at the number of 3000-hr. or 2000-hr. workers as the case may be.

Comparing accidents on the basis of the number of men on the payroll is not strictly correct, although it may answer for all comparative purposes. In most cases the number on the payroll is considerably higher than the number actually at work, thus having a tendency to show in reality a lower accident record than would otherwise appear.

Correct Records Lower Insurance Rates

If the operators are desirous of obtaining lower insurance rates than they are now paying, it can be obtained by keeping correct records of labor and all accidents, and having available sufficient proof to show that the accidents at certain plants are not as high as they are at other plants of a similar nature. The absence of records has a tendency to hold the rates higher than perhaps they should.

The campaign for education of employees in the various industries has also been extended to the mining industry, and many of the larger operators are in various ways making special efforts to educate their workmen. So far as accidents are concerned probably the principal thing that can be done by the operator along educational lines is to see that the employees are thoroughly instructed as to the various dangers to which they may be subject when they enter the mines, and to furnish them, through their superintendents and shift bosses, instructions as to how to avoid accidents, and take care of themselves. Much of this educational work may be done through safety committees, which should consist, in part, of members from the various occupations in and about the mines, each being given an opportunity to make suggestions which in his opinion will prevent accidents in his particular department. Many companies have such committees actively at work and report gratifying results.

Publicity for Successful Safety Methods

Another feature which might assist in accident reduction is the matter of publicity. Whenever a mine operator discovers a means of preventing accidents in certain branches of his work, it would be an inestimable service to his fellow operators if he would in some way let his discovery become known. Any exchange of ideas with reference to safety work among the operators of a district or community should result in much good being accomplished toward a reduction in number of accidents.

The following is submitted as a summary of what the operators may do to assist in this work:

1. Keep exact records of all accidents as to time, place, cause and result of accident similar to the reports required by the insurance companies.

2. Keep detailed records of men employed, days worked, as well as shifts and wages lost by reason of accident. It will assist materially in obtaining equitable insurance rates.

3. Urge the standardization of mining laws, rules and regulations so that all companies will be required to render to the state mine inspector the same type of report.

4. Coöperation with state and federal agencies. This will not be a difficult task when all the facts appear in the operator's records.

5. Spread the safety-first propaganda as much as possible in a manner whereby an interest may be created among the employees, and in this connection make public your methods of accident prevention.

6. Prevent accidents if possible to the point of elimination, and then there will be no need of accident statistics.

Corundum in the Transvaal

A considerable export business in corundum has sprung up in the Transvaal since the war, according to the *South African Mining Journal.* The commercial value of the mineral is, of course, chiefly due to its use as an abrasive, and Canada has hitherto been the chief producer. For various reasons the price has risen considerably since the beginning of the war; and the farmers and natives of the Louis Trichard, Leydsdorp and other districts of the Transvaal are finding the collection and sale of the ore a profitable industry. Several of the land companies of the Transvaal are now engaged in investigating the possibilities of the industry. During 1916 the value of the output was £7762. Previously the quantity had been trifling. It seems extremely doubtful, however, whether this output can continue to find an outside market under post-bellum conditions.

Washington Magnesite Industry

BY CLOUGH D. HUDSON*

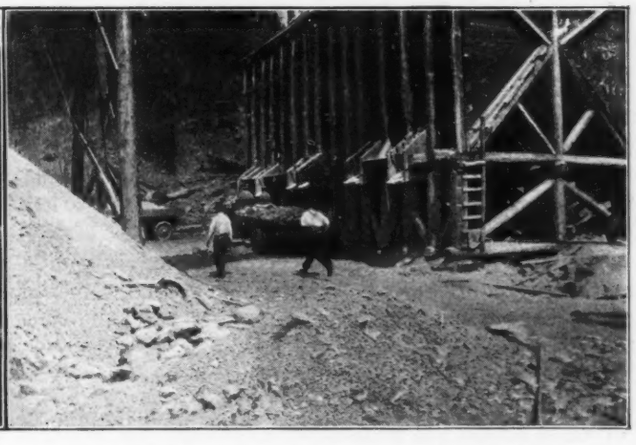
The magnesite quarries of northeastern Washington, opened late in 1916 after the steel industry was brought to the verge of a famine in refractory materials by the stopping of Austrian imports, soon will be in position to produce a large share of the magnesite required by consumers in this country. Today the industry is employing 500 men and represents an investment aggregating $1,000,000. If the present market holds these figures will be doubled in another year.

When the war cut off imports from central Europe, Austria-Hungary was meeting 93% of the annual consumption of 175,000 tons of calcined and crude magnesite in the United States. California was providing 4% of the supply and Greece 3%. Owing to the fact that most of the California deposits occur in small veins, many of which must be worked underground, that supply was inadequate to meet the tremendous demand that developed when the foreign tonnage was cut off. Discovery of the deposits in Stevens County, Washington, came when steel mills were bidding higher and higher for the small lots of magnesite on the Eastern markets. Shipments of the crude rock were started during the winter of 1916 in order to relieve the scarcity. Since the opening of development work this year, from 200 to 600 tons have been leaving the district daily.

The Washington deposits, so far as known at present, may be mined by opencut operations. Assays average 49% magnesia and 51% of carbon dioxide, compared with the commercial standard of 47.6% magnesia and 52.4% carbon dioxide established by the California product. The Washington deposits occur in giant ledges and are free from intrusions or pockets of foreign rock. The magnesite walls are abutted by dolomite or slate. Serpentine, closely related geologically to magnesite, is found in two of the larger quarries; but development has not proceeded far enough to state whether or not it accompanies magnesite throughout the district.

U. S. MARBLE QUARRY OF NORTHWEST MAGNESITE CO., NEAR CHEWELAH, WASH.
Brucite and white magnesite — Dump of shipping material

"RED MARBLE" MAGNESITE QUARRY NEAR VALLEY, WASH.



LOADING WORKS AT FINCH QUARRY NEAR CHEWELAH, WASH.

Development to date and that projected for the immediate future are as follows: Northwest Magnesite Co., headed by R. S. Talbot, of Spokane, is shipping 400 tons of crude magnesite daily from the Finch quarry. Construction of rotary kilns near Chewelah, Wash., is under way and contract is let for five-mile aërial tram connecting Finch quarry and kilns. Company owns U. S. Marble quarry, partly developed. Tunnel will be run this winter to test depth of deposits. Six-mile tram contemplated, connecting U. S. and Finch quarries. Company also owns Midnight claim as reserve. Present haulage charge from Finch quarry is

*Spokane, Wash.

$2.50 a ton. American Minerals Production Co. has developed Red Marble, Allen and Woodbury quarries to shipping conditions. Has a battery of four upright burners at Allen and two uprights at Woodbury. Contract let for 13½ miles of railroad out of Valley, Wash., to tap Red Marble quarry, project to cost $300,000. Contract also let and work begun on one-mile tram connecting quarry and rail terminal. Erection of rotary kilns at Valley is part of company's plan. Double Eagle Magnesite Co. is developing two quarries on adjoining ledges and has started erection of battery of 10 upright kilns. Half-mile tramway is to be erected connecting quarries and kilns. United States Magnesite Co. has one quarry partly developed and is experimenting in manufacture of bricks. The present haulage from the Red Marble and Double Eagle properties is $4.50 per ton, but it is estimated that the rail rate will be 21.2c. per ton. Both quarries are awaiting burning facilities before beginning regular shipments.

The Northwest Magnesite Co. is controlled by San Francisco, Seattle and Spokane capital, W. H. Crocker of San Francisco being the most prominent stockholder. The company is preparing to fill contracts for all kinds of refractory brick and also plans to produce building blocks, its U. S. Marble quarry having large deposits of white magnesite or brucite especially suitable for facing blocks. The American Minerals Production Co. is controlled by Chicago capital and Thomas W. Cole is the present head of the company. California capital is interested in the Double Eagle Magnesite Co. and F. M. Handy, formerly professor of mining in the State College of Washington, is manager.

American Smelting and Refining Co.

The semi-annual report of the American Smelting and Refining Co. for the six months' period ended June 30, 1917, states that the combined income of the company and its subsidiaries from smelting, refining and mining properties, together with miscellaneous earnings, amounted to $18,757,900, after deducting various general expense items. This is an increase of $5,528,841 over similar earnings for the corresponding six months of the preceding year. Against the gross income, as given, various charges amounting to $8,555,780 reduce the net income to $10,202,120 as compared with $11,145,694 reported for the same period of last year.

The charge for depreciation and depletion of ore reserves is $2,396,174 as against $1,019,489 for the first half of last year, the new figure being obtained by a more scientific method of estimation, based on a percentage of appraised valuation of the property of the company. Administrative expenses were $529,027, a slight increase; research and examination expenses were $86,052, a small decrease. Interest on outstanding American Smelter Securities Co. debenture bonds amounted to $25,450 and that on the American Smelting and Refining Co. first-mortgage bonds was $377,483. Miscellaneous profit and loss charges were $752,033 and an appropriation of $500,000 was made for an employees' life-insurance fund, the plan of which insurance will be more fully outlined in the next annual report of the company. There was also a charge for corporate taxes, including accrued income tax and estimated excess profits tax, amounting to $3,889,561. Since the law fixing the amount had not been passed, the board of directors were unable to determine whether the estimate would prove too large or too small.

After the payment of the regular dividends and a special Red Cross dividend of 1% on the common stock, or a total dividend disbursement of $5,037,049 during the six months as compared with $4,502,734 for the same period of last year, there was carried to the credit of the surplus account a balance of $5,165,071. This gives a total profit-and-loss surplus of $28,607,366 on June 30, 1917, as compared with $26,203,398 on June 30, 1916, or a net increase of $2,403,968.

The expenditures for increasing the facilities and capacity of various properties, together with the purchase of new properties, amounted to $3,794,647, which amount has been charged to a reserve account of $6,000,000 established for the purpose from the earnings of the year 1916. The property account has been decreased by the amount charged to depreciation and depletion of ore reserves and by certain small miscellaneous credits, making a total decrease of $2,409,140 since Dec. 31, 1916, which leaves a total property account of $138,756,545 on June 30, 1917. The investments in securities of other companies amounted to $1,744,174, or an increase of $916,897 over the previous six months, representing investments in mining properties in the United States and also in Chile, as well as coal properties and plants for the manufacture of chemicals, details of which will be given in the next annual report of the company.

For the first time in three years or more the company is receiving a net income from its Mexican properties. All the mines and smelters in Mexico are now operating, except those at or near Chihuahua and those at Velardeña. Work is carried on under many difficulties and as yet only to a limited extent. The government of Mexico is anxious for the company to succeed and laborers are more than willing to work. However, on account of the high cost of living, they are suffering to even a greater extent, comparatively, than the inhabitants of the United States. It is estimated that in Mexico the price of necessities is at present six times greater than during the period preceding the revolution. To meet this situation the company is importing and selling such necessities to the laborers at cost, or lower, and has largely increased the wages paid. Transportation is the greatest difficulty, to overcome which the company has purchased the necessary cars and locomotives and, under the permission of the Mexican government, is managing its own railroad transportation. As the business of the company in Mexico promotes the general welfare of the country, by the payment of freight and taxes to the government and the employment of the people, the board of directors has felt that all difficulties should be overcome without regard to temporary profits. It is considered that, as long as the high prices of metals continue, the company will be amply repaid.

Colored Varieties of Quartz have been investigated by Thomas L. Watson and R. E. Beard and the results of experiments are published in *Proc. U. S. National Museum*, Vol. 53, No. 2220. The colors of amethyst, rose and blue quartz are considered to be due to the presence of varying amounts of metallic oxides such as titanium, manganese, iron and cobalt.

Necessity of Mechanical Ventilation for Metal Mines*

Ventilation produced by mechanical means, on a coal-mine scale, is needed in large metal mines to insure proper distribution of air currents to all working places. Reversible type of fan advisable to control direction of air current in case of underground fire. A scheme of ventilation should be planned when development of mines is undertaken. Health, efficiency and safety are found to be promoted by the adoption of an adequate system of ventilation underground.

LITTLE advance seems to have been made in the mechanical ventilation of metal mines for the three hundred years following the practice of the 16th Century, as described by Agricola, until the advent of compressed-air drills. The exhausted air from these then became, and ordinarily still is, regarded as supplying sufficient air to the working place in most metal mines. When the drill is not running, if the atmosphere is oppressive or is bad following blasting, compressed air is allowed to escape directly from the air pipe at the breast of the heading or stope. Undoubtedly this may be sufficient in small metal mines, or in those in which there is no considerable generation of noxious gas, or in which the workings are but a short distance from the drift mouth or shaft. In most metal mines, however, the ore formation generally has its greatest dimensions along the strike and in depth rather than in horizontal width, and, as a result, differences in temperature between the lower workings and the outside atmosphere readily create air currents after secondary connections have been made to the surface.

Inflammable Gases Rarely Occur in Metal Mines

Inflammable gases rarely occur in metal mines and generally there is little absorption of oxygen by the ore or inclosing walls. In mines where there is much timbering it has been found that there is considerable absorption of oxygen by the timbers due to bacteriological action. Nevertheless, from thousands of samples of air gathered from metal mines by the Bureau of Mines, it is rare that the air has a considerable amount of impurity except after blasting. Occasionally, as in the Cripple Creek district, Colorado, metal mines contain large amounts of pure nitrogen gas residual in the strata. Such mines can be worked only by using a plenum (pressure) system of ventilation. In general, however, the chief air impurities in metal mines result from blasting.

In the case of long drainage tunnels, the rule is to ventilate with fans and air pipes and it is obvious that it is an advantage of economic importance to ventilate the heading quickly after blasting so that the miners may get back to their work as soon as possible.

In great orebodies, such as found at Butte, in the Lake Superior iron and copper mines, in the copper mines of the southwest, and especially in the deep and extensive gold mines of South Africa, there has been a gradual introduction of ventilation by mechanical methods apart from the dependence upon compressed air at the faces.

Attempting to ventilate mines by means of compressed air when there is a considerable volume of noxious or poisonous gas present, as from blasting, is extremely ineffective in sweeping away the smoke and gases as this practice merely tends to stir them up; and from a mechanical standpoint it is not an economical use of air, which has usually been compressed inefficiently to a high pressure and is liberated at atmosphere pressure without doing much mechanical work. The only improvement possible in the use of compressed air for ventilation is to cause an air-circuit movement by the aid of "booster" fans.[1]

Two Exits from Every Mine Imperative

It is hardly necessary in this day to present an argument for necessity of having two means of exit from every mine; this is a requirement of the metal-mining laws of most states. Probably over 95% of the metal mines of the country that have reached a permanent basis of ore production possess two exits, and the remainder are probably putting in such secondary exits as rapidly as can be done. Where there are two exits one naturally becomes the channel of the upcast draft and the other that of the downcast. Unfortunately, however, direction of current sometimes becomes reversed with a change of season, and during such change, or approaching it, the current is neutral and natural ventilation underground is insufficient. In such mines there is a necessity for the use of fans. In deep mines, such as are in the Lake Superior copper district, normally the upcast and downcast conditions do not reverse and the natural main upcasting current is strong. It then becomes a problem in such a special case whether in the interest of safety it is not best to install a large fan—which may never be needed except for such fire protection—to prevent a reversal of current in the case of a mine fire in the downcast shaft.

However, in a great majority of metal mines a strong non-reversing current can not be obtained by the difference in temperature between the upcasting and downcasting shafts. Such being the case, it is therefore highly important, both for fire protection and for positive-circuit ventilation, that fans should be used.

The great variety in conditions found in metal mines of the United States, from typical fissure veins to the great irregular iron orebodies of the Lake Superior district, makes it impossible to standardize a method of ventilation for metal mines as for mines in coal seams. Nevertheless, it will be generally conceded that a great

*Excerpt from a paper entitled "Necessity of Mechanically Produced Ventilation in Metal Mines," read by G. S. Rice before the mining-section meeting of the sixth annual safety congress of the National Safety Council in New York, Sept. 13, 1917.

[1]Small compressed-air jets set inside a ventilating pipe, and pointing away from the heading, create a suction draft that has proved effective for long tunnels or raises at a comparatively small expense.—Editor.

deal more might be done in the future development of a mine than has been done in the past if preliminary plans for a ventilating system be borne in mind. This is particularly true in the development of large low-grade deposits the extent of which has been more or less predetermined by prospecting.

Ventilation Usually of Haphazard Character

While metal-mining law requires and modern practice demands provision for two exits, and operators generally recognize the necessity for an air current downcasting in one shaft and upcasting through another shaft, adit or tunnel, the necessity for providing circulation through the workings of the body of the mine has not been well recognized, with the result that in some of the great mines of the United States the ventilation is of the most haphazard or badly arranged character. Often I have had occasion to observe that the main underground fan was ineffective because part of its air discharge had already been in circuit around the mine. Therefore, even when the percentage of impurity in the air might be low this condition does not fulfill one of the most important features of deep metal mine ventilation, i. e., keeping the air-current temperature below that of the mine walls. The temperature in a mine is not always a question of depth or natural heat of the strata, for where there are large masses of timber, as in the caving system using a timber mat, the temperature is frequently far greater immediately under the mat than it is in the deeper development levels.

It is believed that if the same degree of care were taken in laying out in advance a ventilating system, as is given to laying out the levels, drifts, crosscuts and raises for extracting the orebody, a great deal of the difficulty of a physiological nature now experienced by miners in certain districts would be prevented. Such troubles are not simply questions of the workers' temporary discomfort, but their health is likely to become affected and make them susceptible to diseases, thereby lessening their working efficiency and in consequence decreasing the net earnings of the mine. Ventilation, therefore, takes an aspect of economic importance. It is difficult to name specifically mines or districts without making unfortunate comparisons, but the problem is an acute one in many districts, as will be readily conceded by most authorities on mining.

Effect of Hot, Ill-ventilated Mines on Workers

Another phase of the physiological problem concerning workers in hot mines is whether or not the air is in motion—not the high temperature of the air alone. In the experiments conducted by Dr. Haldane, of Oxford, the celebrated physiologist demonstrated in a striking manner that in still, hot air the human body is enveloped in a film of air at or near blood heat and that in such stagnant air there is no evaporation of the sweat to produce a cooling effect on the skin; also that if the air is in motion, unless it be saturated, which is seldom the case, evaporation occurs and the skin is consequently cooled. I recall a case where in a certain stope there was no movement of air, the miners complained of heat and from time to time went to a nearby crosscut where there was a strong current of air, and although in the latter place the temperature was actually several degrees hotter than in the former, the effect was one of considerably greater bodily comfort.

The tremendous variety of mining conditions existing in the United States prevents the formulation of any exact specifications for a ventilating scheme adaptable to all conditions; but, in order to bring out discussion, which it is hoped will be elicited by the suggestions made herein, the following general principles are mentioned with a view to guidance in planning the ventilating system of a new mine, or in adapting the openings of old mines as insofar as it is possible to do so:

General Principles of Mechanical Ventilation

1. That there shall be a permanent upcast and a permanent downcast shaft or tunnel.

2. That the downcast shaft shall be as far as practicable that in which the men are hoisted and lowered—it may or may not be the main ore-hoisting shaft—the object being that in case of an underground fire the main hoisting equipment for men shall be available. If practicable, such shaft and its landing shall be concreted or otherwise fireproofed, and back of each landing there shall be a fire door for protection from fire in the workings beyond.

3. That the main downcast shaft shall be connected to the lowest working so that the fresh air may go to the bottom of the mine and then ascend through the workings to the upcast shaft. Sufficient air is to be diverted on the different levels from the downcast shaft to provide proper ventilation on each level, the returning current to be circuited around the downcast shaft by means of crosscuts or concreted air bridges.

4. That the main ventilating fan be of the reversible type, of fireproof construction and with fireproof housing, and be installed at the surface. Generally the most convenient arrangement would be to place it at or near the collar of that shaft which is not the main hoisting shaft—of course, a tunnel or incline portal would be equally good—so as to avoid an air lock; and therefore would normally be an exhaust fan, although, as stated previously, it should be reversible to provide for emergencies.

5. The fan should be of a size sufficiently large to take care of the greatest volume of air likely to be necessary for at least five or six years ahead. It should be able to deliver or draw air at a pressure in excess of that which could be produced by maximum natural causes; that is, the maximum "motive head" of the air column, due to the maximum difference which may obtain, between the temperature of the mine air and that of the outside air, on the coldest or the warmest day of the year. For mines, undeveloped, such figures have to be more or less conjectural, and so it is often necessary to make assumption based on past experience.

In general, the main fans at metal mines are entirely inadequate, and fans such as are in use at large coal mines should be installed where the workings are expected to be of great extent and many men are to be employed underground. By this is meant fans that will discharge from 100,000 to 300,000 cu.ft. of air per min. against pressures measured by 2 to 6 in. of water gage.

On account of the fire risk it is not good practice to place the main fan underground. There is usually a liability that the air will short-circuit, that is, go round

and round and not be discharged at the surface. Of course, there are unusual conditions where the ground is badly cracked and creviced near the outcrop, and the leakage of air would be too great to place the fan at the surface, but it is an exceptional case where openings can not be sealed by surface covering or by using clay filling.

6. "Booster" fans are necessary in driving exploratory drifts, winzes and raises and also in working high stopes. A new device in the way of canvas tube and its supporting arrangements has been developed recently and makes an admirable auxiliary for reaching the face of drifts and winzes. In order to give adequate ventilation throughout the mine, and especially to provide for fire protection, plans should be made whenever possible, just as in coal mining, for a continuous circuit of air. This should be done as soon as it has been established that important bodies of ore exist.

A number of the greatest fire disasters in metal mines would have resulted in much less loss of life had there been a continuous circuit of air, that the miners could have followed out to the source of intake. The great merit in fireproofed downcast shafts and the landings adjacent thereto is that they enable the hoisting of the men after they have reached the shaft. On the other hand, if an unfireproofed downcast shaft takes fire, as at the Cherry coal mine or the North Butte copper mine, it nearly always spells disaster and the only possible hope then is prompt reversal of the fan, which, if accomplished in time, might save the men. If this cannot be done or if all the escape passages are already filled with smoke, the only thing left for the men is to "brattice" or "bulkhead" themselves in some heading free from smoke, marking with chalk where they have gone for the subsequent direction of the rescue parties.

Need of Fan Installation in Metal Mines

While the cost of providing adequate ventilation is considerable, whether it be in metal mines or in coal mines, it must be regarded as an absolute necessity for deep mining. Any one who has visited deep or hot mines, such as in the Comstock Lode or at Butte, must realize that it is of vital importance to provide the best ventilation possible in order that deep mining may be at all possible. Where nitrogen gas occurs, or where there is spontaneous combustion of rich sulphide ores as in some Montana and Arizona mines, and where those mines cannot be filled with sand or slime, it is necessary to erect fire walls and put in a plenum system of ventilation so that the gases may be forced into the crevices in the strata or behind the fire walls.

The need and importance of mechanical ventilation in metal mines may be summarized as follows:

1. To provide air of good quality for the underground workers in all parts of the mine, including the working face. Exception would have to be made for conditions at the face immediately after blasting, and then only for a short time, during which the miner must be kept away from the face both for the sake of his health and the best interest of the mine operator.

2. To keep down the temperature of the mine air at the working place.

3. To provide a positive movement of the air in hot working places in order to keep down the bodily temperature of the worker and thus increase his efficiency.

4. To provide a positive circuit of air, so that in the event of fire the underground workers may escape by following back the fresh incoming air—provided, of course, that the fire has not started at the intake end. If it has, the only possible way of saving the men is by immediate reversal of the fan, unless they are able to bulkhead themselves in and await rescue later.

Steel Pipe Line Covered With Concrete*

Long stretches of old riveted-steel water pipe have been successfully incased in reinforced concrete by an economical method used by the Temescal Water Co., Corona, Calif., for the last four years. In the light of the present high price of steel plates the work may be of interest to others having pipe lines to replace.

These details were worked out more particularly for use in covering 10,000 ft. of 24-in. riveted-steel pipe line used as inverted siphons working up to 80 ft. head. This line was laid 30 years ago and is beginning to give way near the ends of the siphons, and where light weight steel was used on account of low heads. Possibly 95% of the iron is still in the pipe, but it has rusted badly and pitted particularly at the seams, so that it

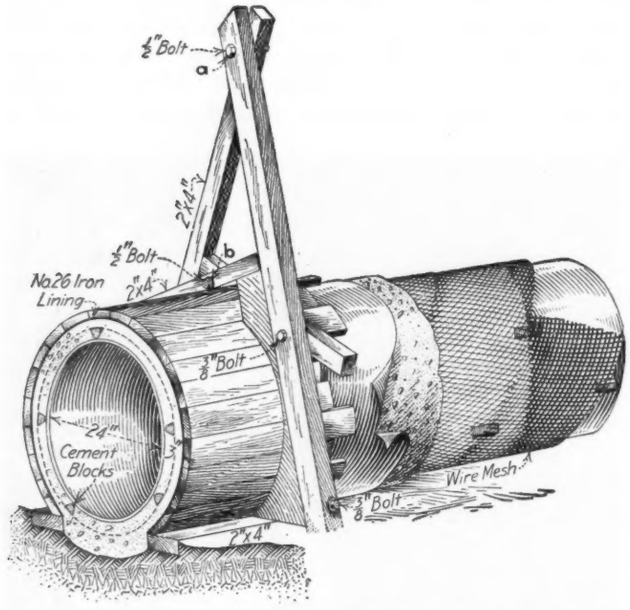
FORMS BLOCKED FROM GROUND, PIPE HUNG FROM TRIPOD

has been necessary to make repairs during the irrigation season. The system not only protects the outside of the pipe and prolongs its life by the jacket of reinforced concrete, but when the old pipe has disintegrated it leaves a reinforced-concrete pipe without joints, sufficiently strong to carry the pressure.

*An article by H. R. Case in "Eng. News-Record," Sept. 20, 1917.

The drawing shows the details of the wood form used in covering the 24-in. pipe. The forms are constructed of Oregon pine and lined with No. 26 black iron, which saves not only the forms but much material, making a smooth outside surface to the finished pipe. Forms for 24-in. and larger pipe are made in 8-ft. lengths, while the smaller sizes are made up in 12-ft. lengths.

After the steel pipe is uncovered it is thoroughly scraped and cleaned with steel brushes. The ground under the pipe is then shaped to the required depth, the pipe being supported on wood blocks until the forms are set. Bedplates of 2 x 4s are then spaced with a template, similar to the end section of the form, on each side of the pipe to support the forms when in place. The wire-mesh reinforcement cut to 50- or 75-ft. lengths is then wound spirally around the pipe and supported where the edges unite by small cement-mortar blocks made in the form of truncated pyramids, 1½ in. high, 2 in. square at the base and ¾ in. at the apex, which is



OLD STEEL INSIDE FORM FOR NEW CONCRETE PIPE

placed next to the pipe. A man with a hand mold will make 2500 or 3000 of the small blocks in nine hours. The edges of the mesh rest on the base of the little pyramids, thus keeping the wire mesh spaced a uniform distance from the steel pipe or forms. As the blocks are placed, the edges of the wire mesh are tied together with No. 24 soft stovepipe wire.

The forms are then placed on the 2 x 4s and held rigid by the two ½-in. bolts as shown. The wood blocks supporting the pipe are removed, and the pipe is held in place by a strand of wire and a turnbuckle clamp until the form is filled to a point where the concrete will support the pipe. The concrete is a 1:2½:1 mixture of cement, sand and crushed rock or screened gravel of ¾-in. maximum size. It is mixed by hand and poured rather wet, being worked to place with a light rod and by tapping the forms with a hammer. In laying the pipe up hill the top openings, as the forms are filled, are closed with covers clamped to place until the concrete sets slightly, when the covers are removed and the surface is well troweled and smoothed. The next morning the forms are removed, and the pipe is painted with neat cement. The pipe is then covered with soil and kept wet for two weeks.

Twelve men will easily build and backfill 140 ft. of 18-in. pipe, 100 ft. of 24-in. or 80 ft. of 30-in. pipe in a day of nine hours. The company is replacing 30-in. steel pipe under 40-ft. head, placed on bridges, with concrete siphons of the same size, at a cost of $2.50 per foot, including the ditching, using collapsible inside forms. Covering 24-in. pipe, including the digging, costs $1.70 per ft., and 18-in. pipe $1.40 per ft. Cement is $2.30 per barrel and labor from $2.25 to $2.50 per day. The mesh used is selected from the stock of the United States Steel Products Co. and varies with the size of pipe and head.

A. I. M. E. Meeting at St. Louis

The American Institute of Mining Engineers will hold their 115th meeting from Monday, Oct. 8, to Saturday, Oct. 13, inclusive, 1917. A special train will leave New York Saturday, Oct. 6, at 2:04 p.m. from the Pennsylvania station, and is scheduled to arrive at St. Louis, Mo., at 5:25 p.m. on Oct. 7. Eastern members can join the party at any of the following points: Philadelphia, Baltimore, Washington, Harrisburg, Pittsburgh, Columbus and Indianapolis. Application should be made to W. V. Kibbe, district passenger solicitor, Pennsylvania R.R. Co., 487 Fifth Ave., New York.

The committee on arrangements consists of H. A. Buehler, chairman; W. E. McCourt, secretary; C. J. Adami, J. A. Caselton, F. W. DeWolf, E. F. Goltra, L. L. Hutchison, Eugene McAuliffe, P. N. Moore, Victor Rakowsky, J. D. Robertson, A. Thacher, H. A. Wheeler and Mrs. P. N. Moore. Registration on the first day of the meeting will be in St. Louis at the Planters' Hotel and thereafter as follows: at Webb City, Mo., Thursday, Oct. 11, at 10:30 a.m.; Miami, Okla., on Oct. 12, at 7:30 a.m.; Tulsa, Okla., on same day, 3:30 p.m. The meeting will disband at Depew, Okla., on Saturday evening in time for visitors to connect with trains for Tulsa, Joplin, Kansas City and St. Louis.

The technical program has been scheduled as follows: Monday, 10 a.m., simultaneous sessions on milling and on coal; Tuesday, 10 a.m., simultaneous sessions on lead and on petroleum; 8 p.m., session on miscellaneous subjects; Wednesday, 2 p.m., simultaneous sessions on ore deposits and on iron and steel; Thursday, 4 p.m., session on zinc; and Friday, 8 p.m., session on petroleum.

Trips have been scheduled as follows: Tuesday, Herculaneum smeltery, St. Joseph Lead Co.; Wednesday, optional all day trip to Illinois coal mine or morning visit to steel works, lead and zinc smelteries and other industries; afternoon trip to Diesel engine plant; Thursday, visit to steam-shovel operations in southeastern Kansas coal field, automobile trip through sheet-ground district, underground visits to Joplin mines; Friday morning, visits to mines and mills of the Miami district; Friday afternoon, Cosden Refinery, Tulsa, Okla.

A special session of the War Minerals Committee on Oct. 9, at 2 p.m., will take place at the Planters' Hotel in St. Louis to secure and condense information as to the relative importance of different properties from the standpoint of domestic mineral production. Committee consists of W. Y. Westervelt, chairman; A. G. White, secretary; W. O. Hotchkiss and David White.

Cost Reduction on the Rand*

Mining and milling practice on the Rand has changed little in the last 20 years. Apparent lowering of costs, G. A. Denny claims, has been effected by mining large tonnages of low-grade rock that does not pay for itself. Profits have therefore suffered. Ore reserves are not properly calculated, sampling methods are illogical, and insufficient or no interest or redemption charges are made. It is suggested that the reduction of an entire district's output be centralized in one large plant.

MINING costs on the Rand have been reduced by 8s. 4d. ($2.03) since 1902 but, in the face of lowered efficiency of white labor, new avenues of expenditure and increased cost of supplies, how could this have been accomplished? Is the reduction a genuine saving or the result of increasing the divisor by ore of unprofitable grade, cheaply obtained but containing less gold than the cost to handle it? Has the reduction, capital and all charges considered, been achieved without serious loss in profit? In the discussion of the mining practice on the Rand, G. A. Denny remarks:

"It is depressing that the practice and system on these fields is becoming more stereotyped. Individuality seems helpless against the inertia of a settled universal opinion that, for the special conditions present, existing practice represents the ultimate possible degree of efficiency."

Unskilled laborers are taught by example and all in one school; methods remain unchanged despite the immensely different problems presented by mining near the outcrop and at incline depths of over a mile below. To direct the conservative tendencies of the natives into new channels is almost out of the question. The tendency of the labor organization is to pattern every mine on its neighbor. Broad characteristics of all mines are identical, there are no particular problems and practice settles into the dead level of conventionality.

"Of all the great precious metal mining fields, this is the only one that in two generations of experience has found it unnecessary to alter the fundamental type of its reduction plant." This is attributable to absence of any difficulty in treating the ore and to centralization of control, which implies standardization; moreover, by no means least, it is the result of the want of a proper charge for capital cost in the operations. Recognition of capital charges in working cost would have been ample incentive for change. Remove the atmosphere of self-satisfaction by impartial inquiry into what the rest of the world is doing; let Rand engineers show their ability to lower capital cost and achieve similar or better economic results.

Methods of calculating tonnage and values of ore reserves, Mr. Denny suggests, that gave approximately accurate results when applied to the average-sized block of 15,000 or 20,000 tons common 10 years ago, may not be invariably used in computing tonnages and values of present-day blocks, which may reach half a million tons. The principle which underlies all mine valuation is the assumed projection into the solid interior of marginal values of the drives. Projection from levels gives a more accurate forecast of interior values than those from winze connections, as the lenses or shoots of higher grade ore are usually disposed with their longest axes toward the dip. Mr. Denny shows that the general formula adopted can only apply in cases in which the width and value are regular. He gives several examples of the danger of throwing into the pot, as it were, highly payable ore and unpayable ore, and extracting from it an "average" payable value. Immense errors may be introduced into the calculations of ore reserves, which justify the suggestion that the area method (delimiting the areas of profitable and unprofitable ore) should be adopted in mines showing sectional and zonal fluctuation in value.

Sampling Stopes Every Five Feet Needless

Sampling stope faces at five-foot intervals monthly Mr. Denny thinks unnecessary. "It is a refinement of practice which gives no adequate return for the expense. Of what use is it to calculate value and tonnage to several places of decimals when the standards by which they are measured are the truck-and-skip tallies of primitive character." The whole system is approximate. For narrow rich reefs a 10-ft. interval is sufficient; for wide low-grade reefs, 20 ft. Doubtful stopes should be sampled at wide intervals fortnightly. Valuations must be much more detailed in low-grade mines, as a drop of half a pennyweight may mean the difference between profit and loss. Assays tend to indicate an average value that is too high. To check this an average is frequently substituted for assays above the average. Mr. Denny believes that a high assay must be taken to represent an area smaller than the one represented by a low assay.

Poor Method of Evaluation of Ore Reserves

The existing method of expressing the value of ore reserves leaves much room for improvement. Without specific knowledge of the actual gold recovered from a certain assay value and the cost of recovering it, not even an approximate idea of intrinsic value nor of relative values of different mines can be gained. One mine may work on a large scale, mining big widths; another may adopt the small-scale policy, mining narrow widths and clean ore. It is clearly unsatisfactory to be unable to interpret from a symbol of value what its real meaning is. The logical symbol is one which directly states the value of this asset, namely, the profit, expressed in currency. An authoritative statement that a mine had 1,000,000 tons developed and fully valued, estimated to yield a profit of £250,000, would mislead no one. It is now quite impossible for anyone correctly to arrive at the profit represented by ore reserves.

Mr. Denny declares that it will cost "in our very extravagant Rand practice about £7 capital outlay per ton milled per month for a 40,000-ton plant." If we estimate that £1,000,000 is required to launch a present-day gold-mining venture, about £800,000 would be for

*Excerpts from a review, by A. Cooper Key, of a paper, entitled "Rand Economics: Some Salient Unappreciated Issues," written by G. A. Denny for the South African Institution of Engineers.

capital account. If the mine had a life of 20 years and milled 500,000 tons a year, each ton should be charged with approximately 3s. ($0.73) interest at 6% and redemption at 4%. Mr. Kotze[1] demands, in his calculations respecting the Eastern Rand, 15% interest as a fair risk. That would bring the interest and redemption charge to nearly 6s. per ton. No ore should be regarded as profitable which does not clear full capital charges. The procedure advocated would play havoc with ore-reserve estimates as now presented, but in the long run would be beneficial.

The profit per ton can be ascertained only for each block on its own merits and to be payable, a block must meet all legitimate charges. The Rand practice of including in payable ore rock of an assay value equivalent to the estimated working cost is quite indefensible. To begin with, the mine-assay value is generally higher than the value recovered. Further, ore is only payable when it yields an amount which includes a fair rate of interest on the investment. The practice of establishing the working cost as the pay limit should be abolished. We should not think of ore reserves in terms of tons but in terms of profit. Working on the principle that tonnage of seemingly payable value is the most important thing in statements of ore reserves, encourages the habit of mining low-grade ore to increase tonnage. Nothing could be more diametrically opposed to the sound conduct of mines as financial ventures than this.

Profit Sacrificed to Low Cost per Ton

Stopes yielding perhaps 12s. ($2.92) per ton are worked continually though the average cost is 18s. ($4.38) as part of a deliberate policy. Inquiries as to the wisdom of this policy are met by the reply that the increased tonnage (a) reduces cost and (b) provides a larger appropriation for mine-development redemption account. The answer to the puzzle as to how ore of lower yield than the average working cost can be profitable lies in the fact that the individual profit made on ores of differing grade must be regarded as a contribution to a general-profit fund, out of which fixed charges must be met. On doubling tonnage, the fixed charges are halved when expressed on a tonnage-milled basis. The application of an average cost leads to most erroneous conclusions.

The treatment of waste rock resolves itself into the following: (1) Does it yield sufficient gold to pay for all legitimate charges it must bear? (2) Is there no more profitable material available? It is surprising that after nearly 30 years the question of rejection and treatment of waste rock is so debatable that even among the largest mines no uniform practice has been adopted. Milling of waste rock may accomplish the reduction in cost per ton but it also lowers the profit. It creates an impression of improved work by a spurious lowering of working cost per ton. This is responsible for lowering the efficiency of mining, since it proclaims "tons" to be the objective, and not profit. The mainspring of all action, all ambition, is tons. The inevitable result is that a premium is put on bad mining.

The increased cost of labor and supplies which the war has imposed on mines working at low margins of profit, burdens them most seriously. It is a question whether such companies should deplete their ore reserves for nominal profits or should conserve them until normal times and add to the development, thus making a greater profit. In the meantime a large part of the native labor such companies employ unprofitably could be transferred to more profitable mines. Many men would also be freed for service at the front.

It may be assumed that eventually at least 25 new companies will be established in the far-eastern Rand. Separate equipment will involve £15,000,000 to £20,000,000 expenditure, incurring a charge to each company of £70,000 per annum for interest and redemption. To prevent duplication and waste, it would be advisable to concentrate the whole of the milling requirements of the Virgin district in one plant, financed independently of the mines, either privately or by government. It should embody most modern practice and economy of expenditure for installment and operation. It would mill from 500 million to 700 million tons during its period of activity, but its growth would be gradual. The tariff charge, to be regulated by the state, should be less than individual companies could hope to attain in their own practice. Mines would deliver their daily quota to the central sampling plant, and there would be no necessity to mill mere tons. There is no practical difficulty whatever, according to Mr. Denny's contention, in carrying out such a scheme.

[1]Government Mining Engineer.

American Cyanamid Co.

The report of the American Cyanamid Co. operating at Niagara Falls and in New York harbor, shows a great increase in its business for the year ended June 30, 1917. Sales were $2,705,054; cost of sales, $1,767,667; general expenses, $253,754; reserve for depreciation, $189,625; leaving net profits of $494,008 as compared with $351,218 for 1915-1916. Other income was $144,641, an increase of $119,468, giving a total profit of $638,649. During the year the company began manufacturing a low-grade cyanide from cyanamid in addition to placing in operation a new liquid-air plant and a sulphuric-acid factory in New York harbor, which will later be supplemented by a factory for the production of ammonium phosphate as a fertilizer. The capitalization has been increased to $7,895,200 of 6% cumulative preferred—on which $439,837.80 of dividends remain unpaid—and $6,514,000 of common.

Tonopah Extension Mining Co., of Tonopah, Nev., reports that for the fiscal year ended Mar. 31, 1917, there was mined 109,402 tons of ore, which yielded in milling 2,068,650 oz. Ag and 19,622 oz. Au, an average of 18.908 oz. Ag and 0.171 oz. Au per ton. This is 6.0222 oz. Ag and 0.061 oz. Au per ton under the average of the previous year. The average price per ounce for silver for the year was $0.70867 and for gold $20.6718, making an average gross value of $17.107 per ton. Milling losses amounted to $1.503, leaving a net recovery of $15.604 per ton. Receipts from sales of products amounted to $1,707,174; cost of mining, $536,097; cost of milling, $396,363; cost of freight, express and refining, $32,430; net operating profit, $746,469. Sundry receipts amounted to $4185, and "Damages," exploration and depreciation were charged off at $44,859, leaving a net realization of $701,610. On the tonnage basis, costs were: Mining, $4.900; milling, $3.623; freight, $0.071; refining, $0.225; losses, $1.530. Profit, $6.785 per ton. Dividends amounting to $702,491 were paid during the year.

Rôle of Vanadium in Alloy Steels*

The presence of a few tenths of a per cent. of vanadium remarkably increases the elastic limit and tensile strength of steel without seriously impairing the ductility or presenting any difficulty in hot or cold working. The prevalent notion that it acts simply as a scavenger is wrong. It has improved high-speed steels greatly and is of value for both castings and forgings.

THERE is a somewhat prevalent popular idea that vanadium is a powerful scavenger, and that the beneficial effects of its use in steel are principally due to its removal of minute, residual amounts of oxygen and nitrogen from the steel. It has even been advanced that when all the vanadium added has been completely used up in scavenging, and none remains in the steel, all the improvement or beneficial effects possible have been accomplished despite the fact that there is an increase in the mechanical properties of the steel with increasing amounts of vanadium present, and that vanadium has equally as great beneficial effects in steels made under reducing conditions, such as crucible and electric furnace steels, as it has in steels made under oxidizing conditions like openhearth and bessemer steels. While it is true that vanadium oxidizes readily and will combine with nitrogen, its value as a scavenger is negligible, as there are much cheaper metals that are as effective, or perhaps more so.

The following discussion will be confined almost entirely to the consideration of pearlitic-vanadium-ternary steel, or simple carbon-vanadium steel, and will not more than briefly touch on the quaternary-vanadium steels.

The remarkable effects of vanadium on steel are due entirely to its presence in the steel as an alloying element and to its influence on the other constituents. When added to steel it is found in both the main constituents, ferrite and pearlite, but principally in the latter. Only a few hundredths of one per cent. of the vanadium combines with the ferrite. This minute amount, however, appears to increase the strength, toughness, hardness and resistance to abrasion of the ferrite. Nearly all the vanadium, however, is found in the pearlite, in chemical combination with the cementite, as a compound carbide of vanadium and iron in the case of ternary steel, and as more complex carbides in the case of quaternary steels.

Vanadium Tends to Form Sorbite in Steel

Vanadium replaces the iron in the cementite or the carbide by increasing amounts until finally when the percentage of vanadium is about five per cent. all the iron has been replaced by the vanadium. The vanadium-containing cementite is not as mobile as ordinary cementite and consequently does not segregate into as large masses but occurs in relatively minute particles and, therefore, is more uniformly distributed. It does not, consequently, readily occur as thin plates in the pearlite but in a granular or sorbitic condition. This strong tendency of vanadium to form sorbitic and even troöstitic pearlite is doubtless one of the reasons for the mechanical superiority of steels containing vanadium.

Vanadium carbide is not as readily soluble on heating as iron carbide, and consequently vanadium steel requires a higher temperature to dissolve the cementite and put the steel in the austenitic condition for quenching. The presence of vanadium does not raise the Ac1 and Ar1 points more than about 10° C., and repeated heatings do not seem to lower the Ar1 point. The Ac2-3 and Ar2-3 points are raised somewhat more and continue to rise with increase in percentage of vanadium.

The effect of vanadium on the physical or mechanical properties of steel increases with the percentage of vanadium until about 1% is present, after which there is a decrease, even in the case of quenched steels. With 3% or more of vanadium the steel is actually softened on quenching until unusually high temperatures are reached, say about 1300° to 1400° C.

High-Speed Steels Improved by Vanadium

Vanadium-steel hardenite has greater power to withstand elevated temperatures without softening or breaking down or separation of cementite. This property is responsible for the ability of high-speed steels, through the addition of vanadium, to stand up longer under the high temperatures developed at the point of the tool in taking heavy cuts at high speed. Percentages of vanadium as high as 3.50 have been successfully used in high-speed steel, and 1.50 to 2.50% are not uncommon, although only a few years ago the percentage ranged from 0.30 to 0.75 and it was thought that more than 1% gave little additional advantage. The improvement in high-speed steel through the use of vanadium has borne an almost direct relation to the percentage of vanadium present and is considered to be from 60 to 100 per cent.

In the case of carbon-vanadium tool-steel the use of vanadium has proved almost equally beneficial, although at present only about 0.2% of vanadium is used in such steel. It has a wider quenching range—that is, can be heated higher without injury—hardens deeper, retains cutting edge longer, and is very much tougher and stronger. A bar of 1% carbon tool-steel containing 0.25% vanadium, quenched and drawn back at 400° C., will bend 90° without failure whereas a similar steel without vanadium will bend only about 20° or possibly 30°. Comparative compression tests of such tool steels with like tempering or draw-back gave on 1¼-in. cubes, 490,000 lb. for the vanadium steel and 278,000 lb. for the steel without vanadium. For battering tools, such as pneumatic chisels, rock drills, etc., vanadium tool-steel possesses marked superiority on account of its combination of hardness, strength and toughness.

Effect of Vanadium in Steel Castings

One of the principal applications of vanadium steel has been for steel castings, particularly for locomotive frames. The composition of the steel is the same as usual for such castings, except for 0.15% or more vanadium. This addition increases the elastic limit of the annealed castings 25-30% without lowering the ductility. The tensile strength is not increased pro-

*Excerpts from a paper by G. L. Norris, presented at th annual meeting of the American Society for Testing Materials a Atlantic City, N. J., on June 26-29, 1917.

portionately in the case of thoroughly annealed castings, but is usually 10-15% greater. Vanadium-steel castings require a somewhat higher annealing temperature than ordinary steel castings. They are also more susceptible to hardening, and therefore should be cooled slowly in the annealing furnace until they have cooled below the Ar1 point. The annealing temperature should be about 875° C.

There is a growing tendency to heat-treat, and quench and temper steel castings for many purposes. Vanadium steel is much more suitable for heat treatment than ordinary steel, as it hardens more on quenching and consequently much higher physical properties can be obtained. Even air cooling from the annealing temperature, followed by an annealing at a low temperature, greatly increases the elastic limit without affecting the ductility.

There is also doubtless a great future for vanadium-quaternary-steel castings, both annealed and heat-treated—particularly the latter—for, as in the case of forged or rolled quarternary-steels, the improvement in the mechanical properties from the presence of vanadium would be much greater even than in the case of simple carbon-vanadium steel. The value of vanadium in simple carbon forging steels has been over-shadowed by the greater mechanical properties of the vanadium-quaternary steels, such as chrome-vanadium, yet they have mechanical properties equal to those of ordinary 3-per cent. nickel steel under like conditions. Excepting where the very high physical properties obtainable from quaternary steels are desired, carbon-vanadium steel can be used to advantage, especially for large forgings.

This steel presents fewer manufacturing difficulties han quaternary steels. It is less liable to losses from shrinkage cracks and checks in the ingot, and to heating and cooling strains in forging and heat-treatment. It requires no more special care in handling than ordinary carbon steel and is worked with equal facility.

Annealed Carbon-Vanadium Steel Equals Heat-Treated Carbon Steel

Carbon-vanadium forging steel in the normalized condition, which may be described as annealed for grain refinement, has physical properties superior to those specified for heat-treated carbon-steel forgings. This simple treatment alone, therefore, gives physical properties sufficiently high for a great number of forgings that would otherwise have to be quenched and tempered.

A large field for annealed or normalized carbon-vanadium steel is its use for locomotive forgings. It is generally conceded that there is need of a steel of greater strength not only to meet present conditions but also to permit of reducing sections of reciprocating parts to obtain better counterbalancing. To meet this requirement the railroads several years ago turned to heat-treated carbon and heat-treated alloy steels, notably chrome-vanadium.

The use of heat-treated locomotive forgings has not proved altogether satisfactory for a number of reasons. One objection to the use of these forgings is the lack of heat-treating equipment in most railroad shops. This operates particularly in repair work where for any reason the forging has to be locally heated to straighten, stretch or shorten, destroying thereby the effect of the original heat treatment and producing inequalities which may result in failure. Probably no other class of forgings is subject to such abuse as locomotive forgings, and under such conditions ordinary heat-treated forgings have not been found reliable. For these and other reasons annealed forgings are preferred. Consequently a steel that could give in an annealed condition physical properties equal to or even better than those specified for heat-treated carbon-steel forgings, would prove very desirable. Carbon-vanadium forging steel responds to heat treatment in a very superior manner and in this condition will meet the requirements specified by the American Society for Testing Materials for quenched-and-tempered nickel-steel forgings.

Petroleum in Russia

The production of mineral oil in the Russian oilfields in 1916 showed an increase of about 27,000,000 poods (1 pood = 36 lb.), as compared with the average total production of the three previous years, according to a British consular report from Baku. This increase is accounted for by the production of the Grozni fields, where new lands have been opened up, and the production of the Surachani field, where several large spouters were brought under control. The actual production of the Baku fields (Balachani, Romani, Sabounchi, and Bibie Eybat) showed a decrease, having fallen from 419,000,000 poods in 1913 to 330,000,000 poods in the year under review. This falling-off in productiveness is undoubtedly attributable to the fact that much less drilling has been done. This is accounted for by the difficulty in obtaining the requisite materials and the high prices asked for them when they are obtainable. Owing to the cessation of exports of the more valuable products to foreign markets, and to the increased demand in the interior of Russia for liquid fuel for factories, railway and river transport, the percentage of residuum for liquid fuel has been considerably increased. An average of over 70% of this product is now being taken off, as compared with less than 60% in normal times, while the percentage of lubricating oils produced is now under 4 as compared with 7, and the percentage of lighting oils obtained has decreased from 26 to less than 23 per cent.

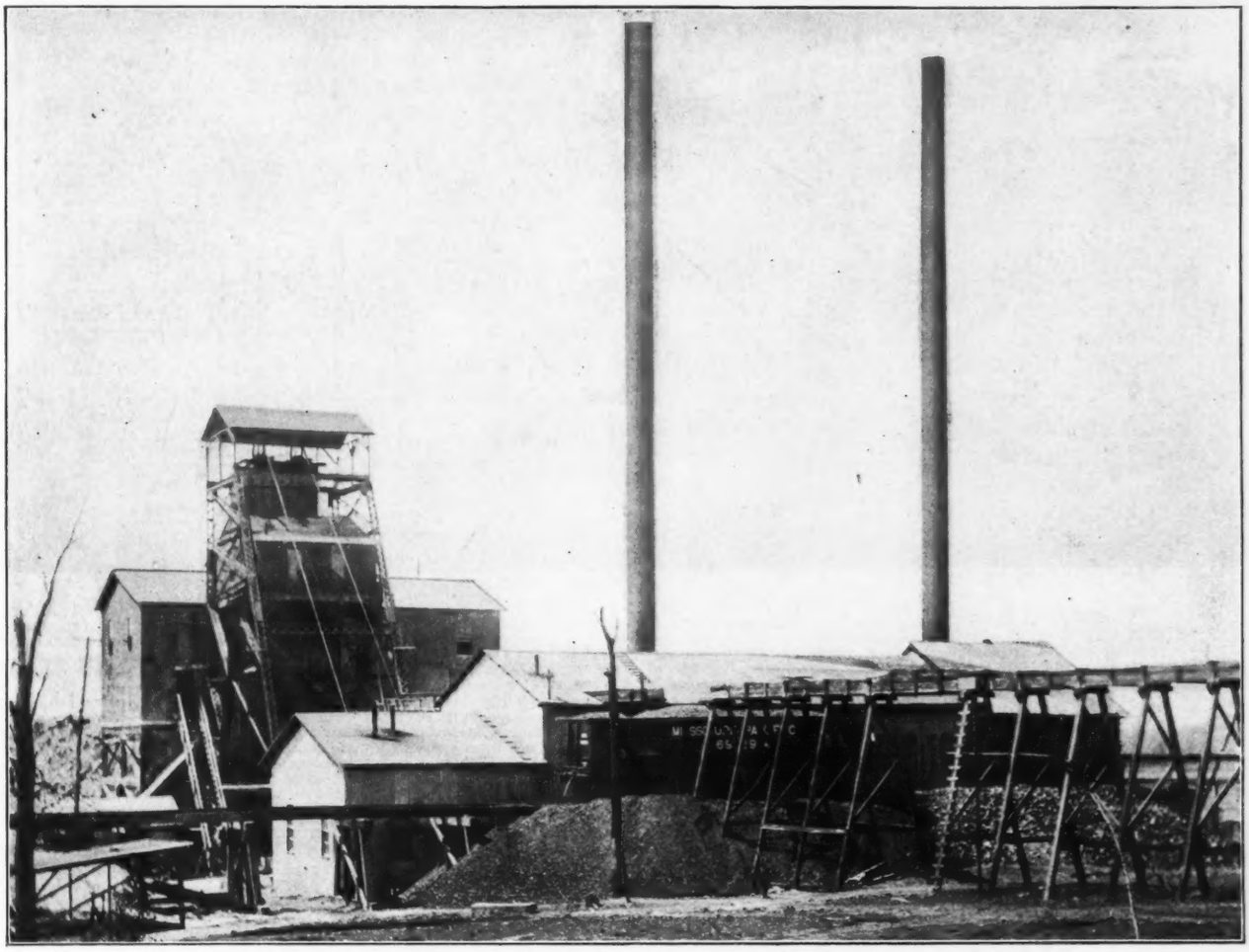
Prior to the war about 45,000,000 poods of lighting and lubricating oils were annually exported abroad, chiefly to Egypt, Turkey and Germany. The cessation of these exports, which were highly profitable to the refiners, has tended to drive the price of oils for home consumption to a higher level than is warranted by the increased price of production.

Mineral Production of Peru

Official revised figures of the mineral production of Peru for 1915 have recently been published. The principal items are as follows, the quantities being given in metric tons unless otherwise stated:

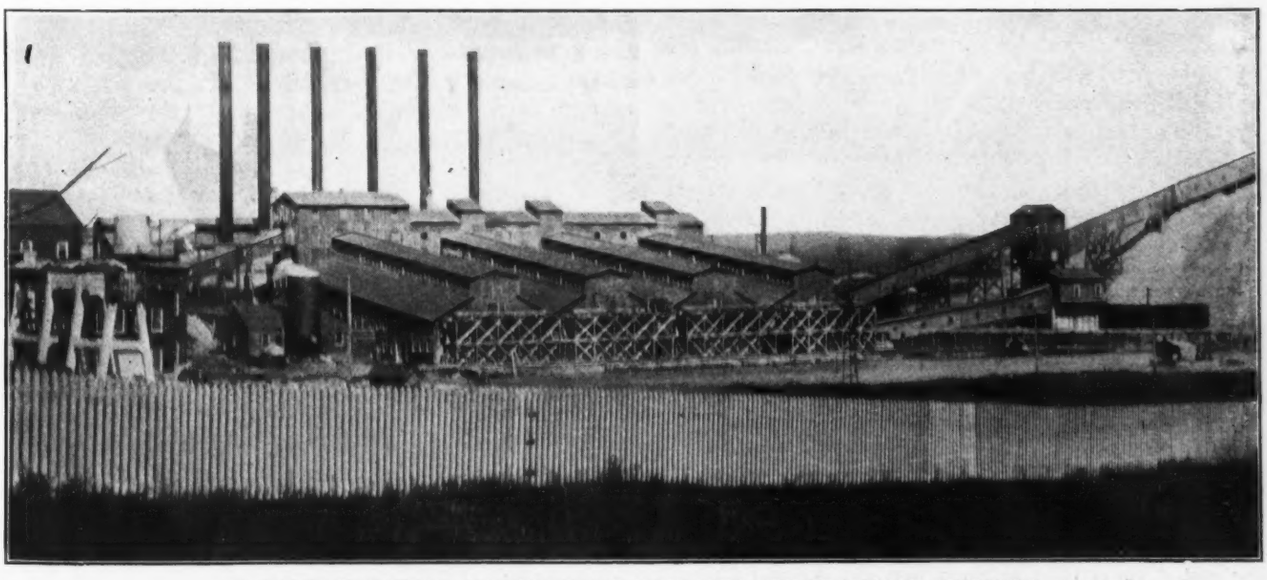
Coal, 290,743; petroleum, 363,162; gold, 1690 kg.; silver, 294,425 kg.; copper, 34,727; lead, 2696; zinc ore, 47; vanadium ore, 3145; tungsten ore, 375; antimony ore, 522; molybdenum ore, 2740 kg.; quicksilver, 920 kg.; borates, 510; salt, 25,729 tons.

The Southeast Missouri Lead District

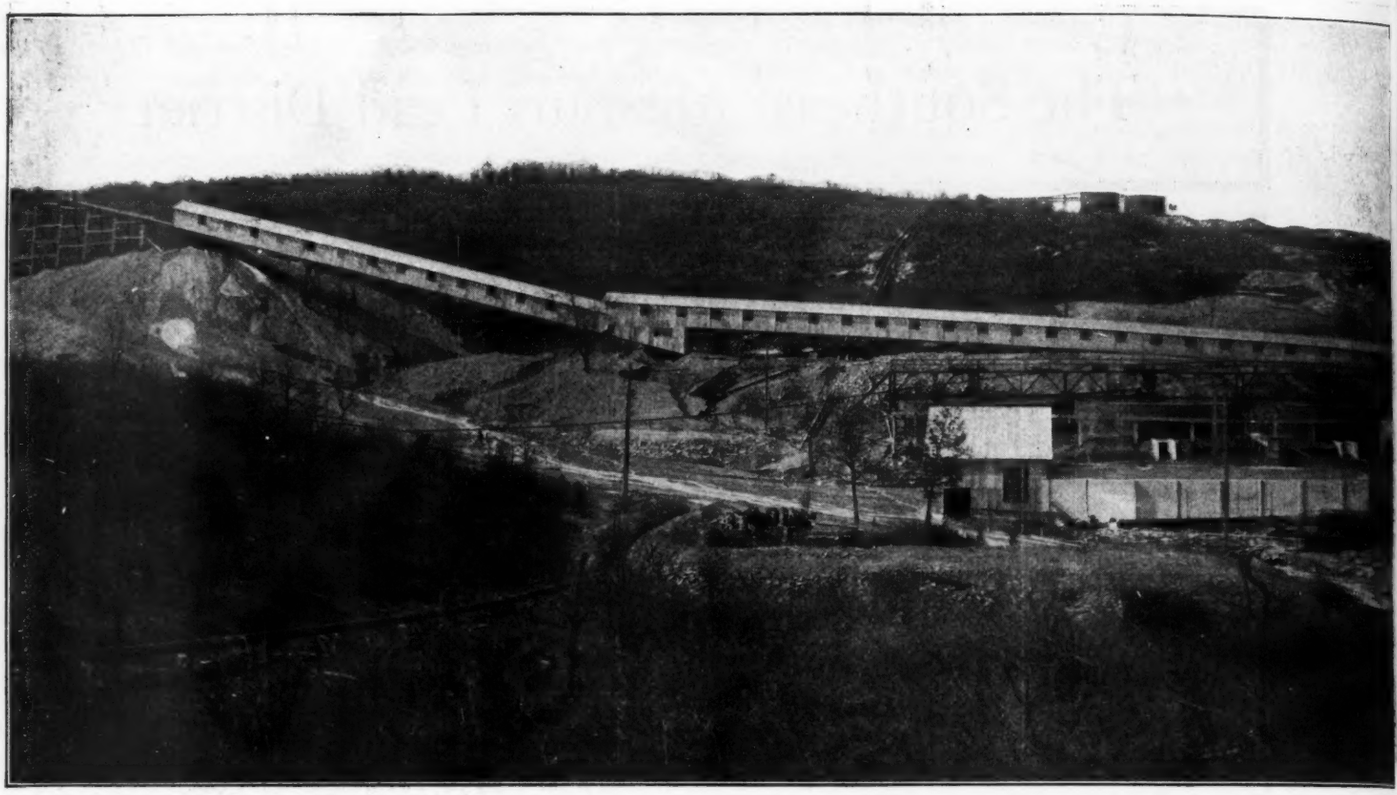


SHAFT NO. 3 OF THE DESLOGE CONSOLIDATED LEAD CO., DESLOGE, MISSOURI

This company, during the last year, operated at full capacity from three shafts. The mill was enlarged and improved and the tailings are now stacked close to the mill by an endless-belt conveyor instead of being hauled away by railroad trains to be dumped in the valleys

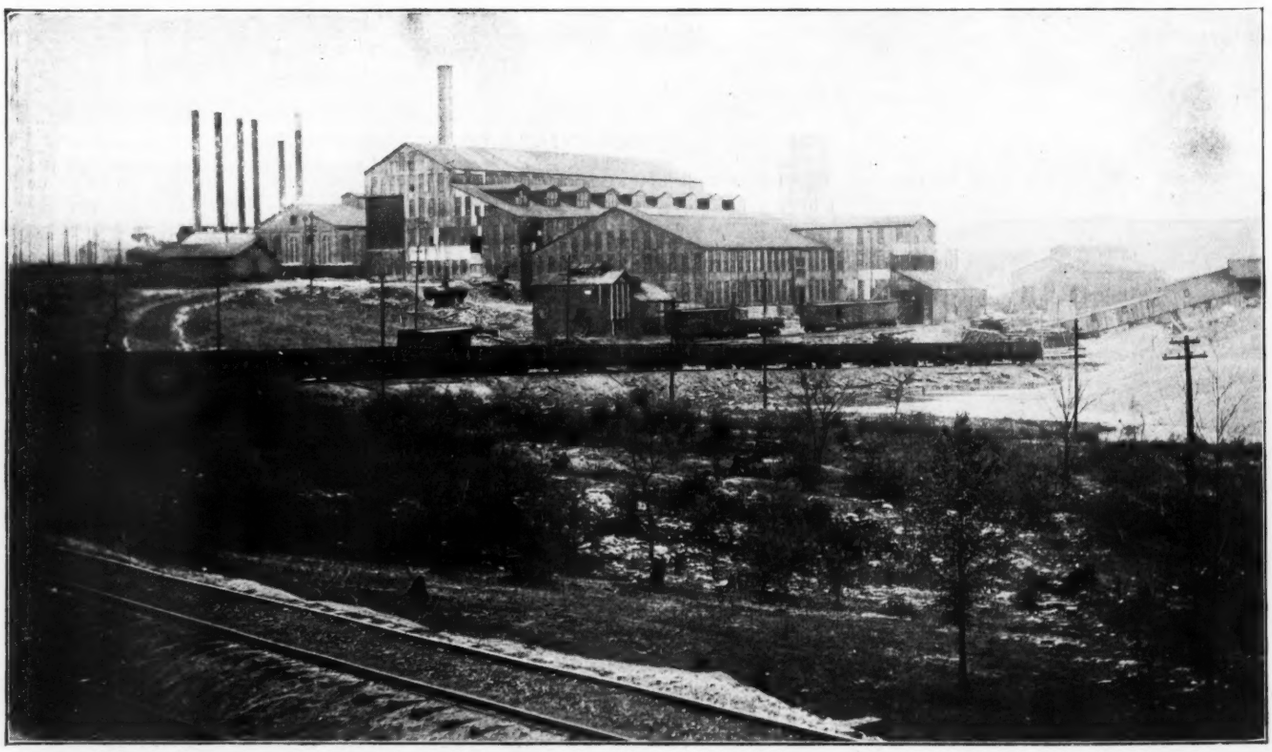


ST. LOUIS SMELTING AND REFINING CO.'S MILL, ST. FRANCOIS, MISSOURI



NEW 300-TON STEEL-AND-CONCRETE MILL NO. 4 OF THE

The Federal Lead Co. made a new high record of production in 1916. A new shaft, No. 12 (shown at the right), was sunk to that was blocked out with diamond drills. It is equipped with a steel headframe and automatic skips that are operated by an feature of the mill is the large number of windows provided. The ore from No. 12 shaft is conveyed by endless belts, after passing with Hancock jigs, trommels, drag classifiers, dewaterers, regrinding mills, 40 Wilfley tables equipped with Butchart riffles, Dorr conveyor to a nearby valley. The mill is of the gravity type, being distinctive in the district as the only one having a natural The mines and mills of the Federal Lead, Boston-Elvins, National, Desloge, Doe Run and St. Joseph Lead companies are working Jefferson, Madison and St. Francois Counties, of which the last named in 1916 produced 90% of the total production from its was the case in St. Francois County during the early history of that district and the relationship between the shallow and deep of such unprecedented prosperity, the district has been most active and buoyant, although somewhat handicapped by labor scarcity result in greater economies, larger tonnages and more efficient work. With the higher prices prevailing for lead, it has been Although the district is in a hilly country, being on the flanks of the Ozark uplift, the most striking and obtrusive features of the silent, huge monuments that attest tremendous activity, but they are also eloquent warnings that the diamond drill must be more

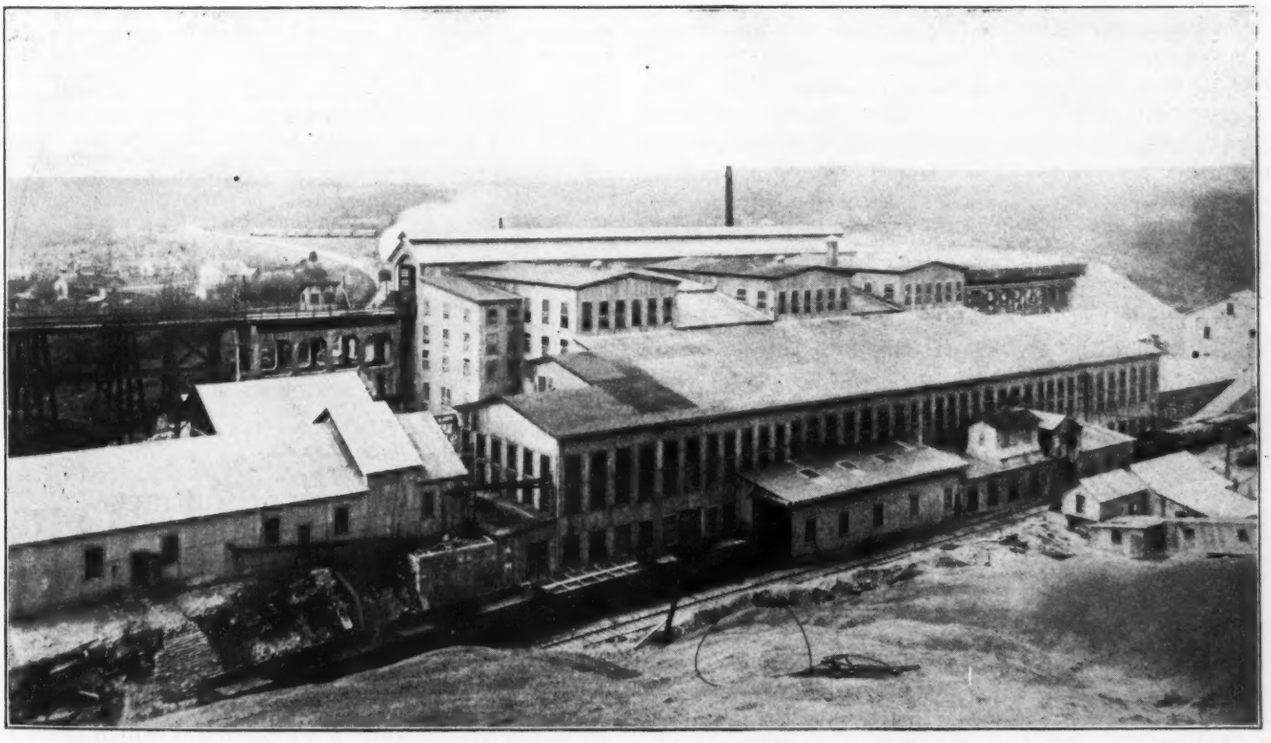


MILL NO. 3, FEDERAL LEAD CO., FLAT RIVER, MO.

The central power plant at No. 3 mill was enlarged last year by the addition of two 2000-kw. turbines equipped with jet condensers. Two water-tube boilers, of 600 hp. each, were addedand a water-softening plant was installed

FEDERAL LEAD CO. AT ELVINS, ST. FRANCOIS COUNTY, MISSOURI

a depth of 459 ft. on the old Central tract about ¼ mile east of Elvins and is now an important producer from the large orebody electric hoist with current from the central power plant at No. 3 mill, about ½ mile distant. The new mill started last March. One through an independent rockhouse equipped with two large gyratory crushers that feed to disk crushers. The mill is equipped thickeners, a flotation unit, Oliver filter and steam drying plant for flotation concentrate. The tailing will be moved by belt sloping base. Southeastern Missouri produced about 184,000 tons of pig lead in 1916, which approximated $25,000,000 in value. full crews, trying to make another high record for 1917. The district embraces the area included in Washington, Franklin, big mines in deep disseminated deposits. Shallow lead deposits are for the most part being worked in the other counties, but this deposits in this county it is believed will be repeated in the others as can only be proved by deep drilling. With the stimulus and coal shortage last winter. All the operators have increased their plants and are making important improvements that will possible to work ores carrying only 2% of lead with profit, although the average for the past year was slightly over 3% of lead. district are the enormous piles of tailing that now loom up as the most impressive feature of the landscape. They are not only active in the future to replace the orebodies that are being rapidly exhausted by the modern large mills



ONE OF THE MILLS OF ST. JOSEPH LEAD CO., ST. FRANCOIS COUNTY, MISSOURI

This company, the most important lead producer in the state, was the pioneer in the development of the disseminated deposits. It operates three mills: A 2100-ton plant at Bonne Terre, a 1750-ton mill at Leadwood and the 4000-ton mill at Rivermines

Monazite Found in Mysore, India

It is reported by the Geological Department in Mysore that monazite has been discovered in the state, according to United States Consul Lucien Memminger, at Madras, India. The discovery was made quite by accident, by Sambasiva Iyer, who in the course of his geological excursion work happened to come across a few pieces of the mineral in the metal heaps stacked near the roadside in the precincts of the village of Yedur, south of the Vasavangudi Extension, Bangalore City. It was then traced to the quarry for road metal close at hand, and the identity of the mineral itself was subsequently verified by chemical analysis. A requisition was afterward made to the Industries and Commerce Committee for funds to have the place opened up, with a view to ascertain the mode of occurrence of the mineral and the probable quantity available for commercial purposes.

Monazite Found in Situ

Work was soon commenced, with the result that mineral monazite was discovered *in situ*. Dr. Hayden, the director of the Geological Survey of India, and three other Geological officers, with H. M. A. Cooke, of the Kolar gold field, who manifested a keen interest in the discovery, visited the quarry and remarked that this was the second place in India where the mineral was found *in situ*. The large size of the crystals was especially remarked upon as being unique. The question of ascertaining the commercial possibilities is being worked out and Dr. Hayden agreed that some further work should be done, since the results of operations so far was not conclusive either way.

Another rare mineral allied to samarskite has also been discovered in this quarry. It occurs in the quartz of a pegmatite "run" in gneiss, which is the country rock. Samples of this have been sent to Calcutta for analysis in the geological laboratory there. The two minerals, monazite and samarskite, occur in the same pit and within about a yard of each other. The trend of the veins bearing these minerals is the same as that of the country rock, and occurrence of both in the form of small lenticular pockets in parallel runs, suggests a common mode of origin. The commercial value of the latter deposit will be ascertained when that of monazite has been determined.

The mineral survey now being conducted in Ceylon in coöperation with the Imperial Institute has led to the discovery of beach deposits of monazite sand, which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute, and the results are so promising, says the *London Economist*, that the government of Ceylon has arranged to work the deposits. Suitable British concentrating machinery has been selected by the institute for the purpose, after experimental trials, and will shortly be shipped to the colony. This is the latest chapter in the story of the long struggle to rescue the gas-mantle industry from German domination. Formerly the monazite deposits in Brazil were the only commercial source of supply of thoria, and these were controlled by the German Thorium Syndicate. The Brazilian monopoly enjoyed by this syndicate was broken by the discovery of extensive deposits of monazite in the state of Travancore in India, so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thoria as the Brazilian monazite. The German syndicate, however, obtained control of the company formed to work the Indian deposits, and they continued to exercise a dominating influence over the industry till the outbreak of the war. Since then the company has been reconstructed and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up, and will be worked by a second British company. The work of the Mineral Survey has shown that Ceylon can furnish several other thoria minerals besides monazite. Among these is thorianite, the richest known source of thoria. This new mineral at first was sold in England at as high a rate as £1600 per ton, but the deposits have proved to be limited.

Copper at 23½ Cents

This is the official statement from the Committee on Public Information, under date of Sept. 20, 1917, released for morning newspapers of Friday Sept. 21, 1917:

After investigation by the Federal Trade Commission as to the cost of producing copper the President has approved an agreement made by the War Industries Board with the copper producers, fixing a price of 23½c. per lb., f.o.b. New York, subject to revision after four months. Three important conditions were imposed by the board: (1) That the producers would not reduce the wages now being paid; (2) that the operators would sell to the Allies, and to the public, copper at the same price paid by the Government, and take the necessary measures, under the direction of the War Industries Board, for the distribution of the copper to prevent it from falling into the hands of speculators who would increase the price to the public; and (3) that the operators pledge themselves to exert every effort necessary to keep up the production of copper to the maximum of the past as long as the war lasts.

The War Industries Board felt that the maintenance of the largest production should be assured and that a reduction in wages should be avoided. The stipulation that present wages shall not be reduced compels the maintenance of the highest wages ever paid in the industry, which without such stipulation would, with the reduction made in the price of copper, be reduced under the sliding scale so long in effect in the copper mines. Within this year copper has sold as high as 36c. per lb., and the market price would now be higher than it is had it not been well known for some weeks that the Government would fix the price.

The principal copper producers throughout the country have evinced an admirable spirit and for weeks have promptly supplied every request of the Government for copper, without awaiting decision as to price, agreeing to accept the price which the Board should ultimately fix. The proper departments of the Government will be asked to take over the mines and plants of any producers who fail to conform to the arrangement and price, if any such there should be.

Mine Pumping Contract

By A. L. H. Street*

When a contract to pump a mine contemplates performance of such work for an indefinite period, the agreement is terminable at the will of either party according to the view taken by court of appeals at Kansas City in the late case of Latshaw vs. Stoddard, 194 Southwestern Reporter, 727, in a controversy which arose in the Joplin district.

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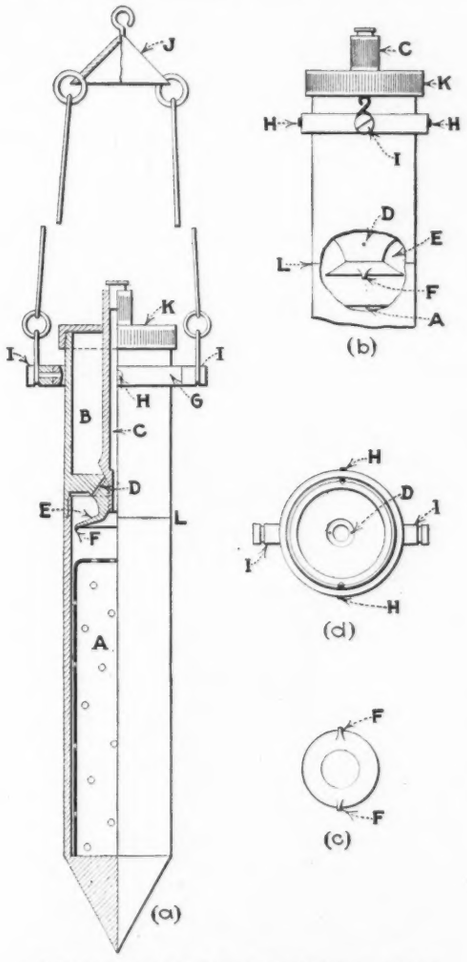
Details of Practical Mining

The McKay Back-Sight Lamp

By Guy R. McKay*

Every engineer who has "swung a transit" in a long tunnel in operation has wished for an adequate, dependable, self-illuminated back sight. When the tunnel is straight and dry, and less than 3000 ft. long, a large plumb bob hung just inside the portal with the daylight as a background furnishes an ideal back sight; but when, through curves, mist, or distance, the portal is obscured or invisible, the difficulties of tunnel surveying are greatly multiplied.

At the Snake Creek tunnel, in the Park City district, Utah, an acetaline back-sight lamp has been developed



DETAILS OF McKAY BACKSIGHT LAMP

which answers the purpose very well. The lamp consists of a cylindrical metal casing made in two parts which screw together at *L*. The lower portion contains a metal carbide container *A* which fits loosely into the casing. It is closed at the top and open at the bottom, and perforated to permit access of the water and escape of the gas. This container permits the lamp to be filled and emptied easily and, by forcing the water to run down the sides of the casing, gives it a better opportunity to attack the carbide at the bottom first, thus preventing the formation of a layer of spent carbide at the top which would protect the fresh carbide below and hinder the escape of the gas.

The upper portion of the lamp consists of a water chamber *B* with a screw cap *K*. Through this cap the gas tube *C* projects. This tube has a cone-shaped portion near the bottom, which seats tightly into the bottom of the water chamber when the tube is screwed down, closing the water ducts *D*. When the lamp is in use the gas tube is unscrewed sufficiently to open these two water ducts and permit the water to run down on the apron *E* and drip from the wires *F*, shown in plan at (*c*). The function of the apron *E* and wires *F* is to prevent the water from running under the bottom of the gas tube and stopping the free passage of the gas.

The lamp is suspended in a gimbal ring *G* at the points *H*, shown in plan (*d*). The ring is suspended by two hooks *I* which fasten through brass chains into a hood *J* which prevents water from dropping on the flame. The hood has a swivel hook in the top by which the lamp can be suspended. The upper end of the gas tube *C* is made to receive an ordinary gas burner such as those used in miners' cap lamps of the Baldwin or Justrite type. In practice it was found that these frequently dropped out and were lost or broken, so an ordinary 0.22 short rifle cartridge was substituted. A fine needle hole was punched accurately in the center of the empty cartridge and was driven down into the gas tube, which happened to be just the right size. Since then there have been no burner troubles. The lamp is constructed symmetrically and balanced so that it hangs in a vertical position with the flame exactly under the spad. The flame can be readily bisected with the vertical cross wire of the transit at almost any distance.

*Park City, Utah

Speeding Up the Drill

Considerable discussion and effort has taken place in an attempt to get more work from machine drills. There are many ways in which this may be accomplished but also many obstacles when it comes to active practice. It is the object of this article briefly to outline some of these methods and to describe one in particular.

In analyzing the cost of breaking rock it has been found that the greatest item of expense is miners' labor, and the labor situation of today is such that it is poor policy to try to get any more work out of a man. The only way out of the difficulty is to make it possible for a man to do more work without expending any more energy. In view of such considerations methods of speeding up the drill seem to offer the best solution and group themselves under the following heads: (1) Increasing the actual drilling time of the machine. (2) Increasing the reciprocating speed of the machine.

The importance of the first factor is realized by few. A little time spent with the stop watch will show that machines are actually operated from 25% to 50% of the total shifts' time, or from two to four hours of the customary eight. Personally, I have never known one to run as high as four hours out of eight. The rest of the time is spent in various other operations, such as "mucking back," mounting, changing drills, moving the machine, tearing down, loading and firing the holes, etc. All these things have to be done by the miner and take up a large part of his shift.

The diminution of such delays in drilling must be made according to the conditions in various places. In a general way only a careful study of delays will suggest remedies. In many cases lighter machines and mountings can be used to advantage. In drifting the miner's greatest delay is mucking out a place for his post. Where there are two 6- to 8-ft. wide drifts not too far distant on the same level, the following is a good time-saving method:

Instead of using one machine per shift in each drift, work both machines in one drift on the day shift and move them to the other on the night shift. In the mean time the first drift is mucked out and ready for a clean start on the following day shift. This adds from one to two hours to the available drilling time. Needless to say, the miners are glad to be relieved of the strenuous mucking at the start of the shift. There is no additional labor involved in this arrangement and it is only impracticable where the ground is so soft that there is not enough drilling in a round of holes to keep two machines busy for a shift. Careful attention to the supply and quality of drill steel will also help to increase the machine's running time. These are merely suggestions and may not apply in all cases. Some day the rock-drill manufacturers will devote more time and study to the designing of a machine that will facilitate the changing of drills and other operations that mean lost motion to the miner.

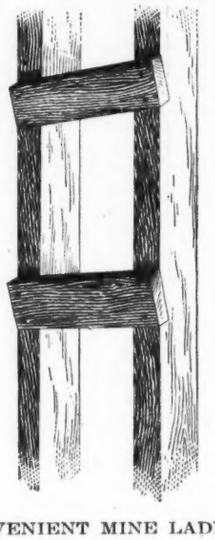
In the second method of speeding up the drill it is evident that, if a machine is only reciprocating from two to four hours in a shift, everything should be done to get a maximum amount of hole drilled in that time. This means a close study of different types and makes of both machines and drills to determine what is best suited to the ground. There are several makes of machines on the market as well as a diversity of opinion as to which are best. That is a question that can only be decided by experiment in each case. The same applies to various types of drill bits. Of course, a small hole can be drilled faster than a large one and here we have the big advantage of the Carr bit with its small gage changes. On the other hand, a small hole will not hold so much powder. In the latter case the solution is either to use stronger powder or place a smaller burden on each hole. The powder solution is preferable, of course, but there are mines where the ventilation is too poor to care for the larger volume of fumes that come from powder of greater strength.

There is one thing that will increase drilling speed in all cases and that is getting every available pound of air pressure behind the hammer. Pressure-drop through pipes, hose, inlet ports, etc., has been carefully measured and recorded, but there are still a surprisingly large number of mines where no attention is given to such matters. To put the loss in drilling speed into something more tangible than merely the pounds drop in pressure, an interesting test was conducted.

A place was selected where there were two machines in good condition, supplied with air through oversize pipes to insure a maximum pressure. A globe valve was inserted in the pipe line near the machines, and a pressure gage attached between the valve and the machines. For an entire shift the pressure was kept down to 55 lb. by manipulating the valve, and the drilling speed of the machines recorded in the usual manner. The next day the test was repeated with a constant pressure of 70 lbs. This 15-pound increase in air pressure increased the drilling speed by 37 per cent. By drilling speed is meant inches drilled per minute of actual reciprocating time. The result obtained was almost startling although the test was simple and easily performed. A 15-lb. drop in pressure is quite common in conducting compressed air through pipes, but a difference of 37% in drilling speed is enough to make anyone "sit up and take notice." In this particular case it led to a careful investigation and to the adoption of certain standards in regard to minimum size pipes, hose, inlet ports and connections. The air-pipe equipment of each level was carefully worked out so as to comply with a fixed maximum permissible drop in pressure.

Design for Stope Ladder

Where it is necessary to haul timbers up into a stope through the manway, the nuisance of timbers catching on the ladder rungs can be eliminated by setting in the rungs as shown in the drawing. Rungs set in this manner are not weakened for man climbing but care must be exercised in sending the ladders into the mine so that they will not be put into place upside down. With such ladders, timbers may be easily hauled over inclined as well as vertical ladderways.



CONVENIENT MINE LADDER

A Drifting Record at the Old Dominion mine, Globe, Ariz., was made this year when 197 ft. of drifting was accomplished in 14 days.

Mining and Metallurgical Machinery

Hollow-Steel Hole Puncher for Drill Sharpener

The accompanying illustration shows a device recently adapted for attachment to the Sullivan drill-sharpening machine, to permit rapid and convenient punching out of the hole in hollow drill bits and drill

FIG. 1. FORGING BIT AND SHANK ON HOLLOW DRILL STEEL

shanks. Blacksmiths know that the action of upsetting hollow drill steel and of forging it tends to close the hole, so that some means is necessary for opening it again to its full size. Various appliances have been developed for this purpose in order to save the time required to use a hand punch. The dolly pin operates satisfactorily in some cases, particularly on the larger sizes of steel, or when the work to be done is not of a kind that will close the hole seriously. A special pneumatic punch has been used with good effect; but this is rather an expensive and elaborate apparatus to install for this little job. As shown by the accompanying illustration, a Sullivan DB-13 air-hammer drill, such as is used frequently for hitch cutting and trimming, is the tool employed in the present device. This tool weighs 14 lb. Its two essential features are a push-throttle handle and a nose chuck with a knurled or milled cap, which is screwed to the end of the cylinder to hold the drilling tool in position. The tool is supplied with a collar forged on the shank to prevent it from being pulled out of the chuck.

As will be noted from the illustration, the drill is placed at the back of the sharpener on a special clamp or brace bolted to the frame for this purpose, and so arranged that the handle of the tool is permanently held while the cylinder is left free to slide back and forth on a support. The method of using the tool is as follows:

The bit is forged and sharpened first in the usual manner. The operator then places the bit end of the steel over the end of the punch, which is inserted in the chuck of the DB-13 tool. A slight thrust by the operator opens the throttle and starts the tool reciprocating

FIG. 2. CLEARING CENTRAL HOLE BY MEANS OF SPECIALLY ATTACHED DEVICE

so that the hole is quickly opened to full size. When the punch has advanced far enough into the steel, a quick pull releases it. Some punches have been made up with a blunt end with the size of the punch reduced just back of the point. This is said to give better results in removing the steel from the punch. In some cases operators have elaborated the bracket for

holding the DB-13 tool by adding a guide arm in front on which the steel can be rested when thrusting it onto the punch. This is said to save time in handling.

This special attachment will be regularly furnished on any Sullivan drill-sharpening machine and, when so furnished, the tool is equipped with a special handle and is permanently placed in an opening cut in the vertical frame. The cut, however, shows a homemade form of bracket, which can be adapted for attachment to any sharpener in the field. The economy of time and labor involved in the use of this tool has proved important in blacksmith shops where a large amount of hollow steel has to be handled.

There are no economic advantages in wet machines unless drills and steel are kept in condition. The introduction of refined machinery demands refined care and it is not enough to give a miner a perfect machine. It must be kept tuned up for him. Hollow steel must be kept hollow.

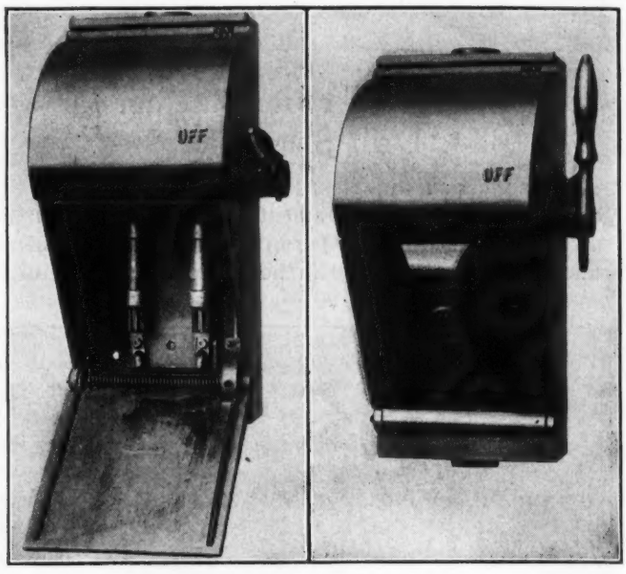
Gilbert & Barker Portable Oil Tank Outfit

For the purpose of providing a convenient method of handling oil around the shop, the Gilbert & Barker Manufacturing Co., Springfield, Mass., is now manufacturing the portable pump and tank outfit shown in the illustration. The tank is made of steel plate with oxy-acetylene-welded seams. The frame and axle are of wrought iron, welded into one piece, and are mounted on 6-in. malleable-iron wheels. The pump can be set to fill any small-size container without overflow and has a lock to prevent unauthorized use. A pan is placed on top of the tank for holding oilers, funnels, etc. The capacity of the tank is 30 gal., but the space occupied is considerably less than that taken by an ordinary barrel. While the tank is not intended to be large enough for general storage purposes, it forms a convenient means for transporting oil from the main storage to the point where it is to be consumed.

PORTABLE OIL-TANK OUTFIT

Westinghouse Safety Switch

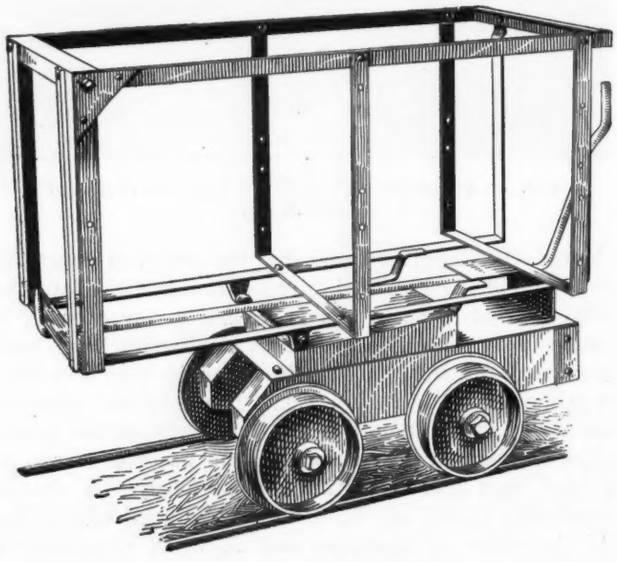
The knife switch illustrated, which is so constructed that all live parts are totally inclosed and inaccessible except in case of real need, is the product of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn. The device consists of an ordinary single-throw knife switch and fuse holders inclosed in a cast-iron box with an operating handle outside of the housing. The box is designed for conduit connection and has a partition separating the switch blades from the fuses. The upper, or switch, compartment can only be opened by removing two machine screws, while the door to the fuse compartment may only be opened while the operating handle is in the off position. When the door of the fuse compartment is open, it is impossible to close the switch. Means are also provided for locking the switch handle in position to prevent tampering by unauthorized persons.



WESTINGHOUSE SAFETY SWITCH

Skeleton Mine Car

The skeleton mine car shown in the illustration is a development due to the high freight rates and high cost of materials. As noted, the frame is ready for either wood or old sheet-steel lining which may be salvaged from around the plant. The "skeleton" comes from the closet of the Truax Manufacturing Co., Denver, Colo.



SKELETON MINE CAR

Events and Economics of the War

The deceit of Bernstorff while ambassador to the United States and the pro-German activity of certain citizens have been revealed during the week by the Government; letters seized show that the embassy had been spending money in attempts to influence Congress and that writers in this country were paid to distort the truth to favor Germany. A nationwide plot of the I. W. W. against the Government has been disclosed at the trial of draft resisters in Oklahoma. The price of copper has been set at 23½c. per lb. and prices have been fixed for pig iron, steel, iron ore and coke. The House has passed the $7,000,000,000 war credit bill and the Senate the $11,538,000,000 bond bill; the war-revenue bill is deadlocked in conference and the war-insurance measure is being considered.

In France, the British broke the German lines near Ypres on an eight-mile front and advanced a mile. The Italian campaign is apparently over; Turks are aiding the Austrians on this front. Korniloff is on trial for treason in Russia. In replying to the Pope's proposals Germany failed to state her peace terms; an apology to Sweden has been made for the embarrassment caused by the Luxburg incident. The Argentine Congress has voted to break with Germany and has mobilized its navy; many strikes in the country are said to be due to German influence. Costa Rica has severed relations with Germany.

Hoover Discusses War Economics at Business Convention

The delegates to the war convention of American business men, held at Atlantic City, Sept. 17-21, by the Chamber of Commerce of the United States, were addressed by many prominent men, including Secretary Franklin K. Lane, Frank A. Scott, chairman of the War Industries Board, Judge Robert S. Lovett, A. C. Bedford, president of the Standard Oil Co., and Food Administrator Herbert C. Hoover. In part, Mr. Hoover said:

One looming shadow of this war is its drift toward socialism. For the gigantic sacrifice of life the world is demanding a sacrifice of property. We will surely drift to that rocky coast unless we can prove the economic soundness and willingness for public service of our commercial institutions. The alternative to failure of our commercial system to maintain its place and serve public interest is rigid autocratic governmental organization of industry of the German type.

The large question of the hour is price fixing, for the suspension of the law of demand and supply as an equitable, economic law is forcing our hand in every direction. We will find as we go on with the war and its increasing economic disruption that first one commodity after another will need to be taken into control. We will, however, profit by experience if we deal with every situation on its own merits. So long as demand and supply have free play in a commodity, we had best leave it alone. One point in the mind of the public I am anxious to get clear. The Food Administration is limited absolutely to that area of commerce between the producer and the retailer. We can only use influence on both the retailer and producer, and depend upon their patriotism. In this area we can only regulate the flow of trade and hold it to moderate profits and excise speculation.

High prices reduce consumption, but through the methods of famine. There is no national conservation in robbing our working classes of the ability to buy food. Real conservation lies in the equitable distribution of the least necessary amount, and in this country we can only hope to obtain it as a voluntary service. If we are to have ascending prices we must have ascending wages. But as the wage level rises with inequality, it is the door leading to strikes, disorder, riots and defeat of national efficiency. The verdict of the world's experience is in favor of price control as the lesser evil.

The total experience of Europe has demonstrated that many methods of price control such as maxima and minima are a fallacy, but one formula has remained, and that is the fixed, specified price for every stage of a given commodity based, as nearly as may be, on the cost of production and a reasonable return for capital. The constant dominant thought in price fixing must be the stimulation of production. The result of price fixing in wheat and flour has reduced speculation and distribution charges so that there is a $3 per bbl. increase to the farmers and $3 decrease to the consumer. It appears to us that no right-minded man wants extra profit from the war. If he does he should be branded with the brand of Judas for selling the blood of our sons for profit.

American Committee of Engineers in London

The "American Committee of Engineers in London" was formed a few months ago by American engineers and business men in London for the purpose of suggesting to the Government of the United States plans that might be useful in carrying on the war; also to offer their services for consultation and advice to the Government's representatives, should this be desired. The complete list of members is as follows:

Col. J. W. Boyle, mining engineer; A. O. Cautley, mining engineer; H. Stokes Waite, consulting engineer; S. C. Magennis, mining engineer; H. A. Titcomb, mining engineer; W. B. Poland, railway engineer; Millard Shaler, mining engineer; D. P. Mitchell, mining engineer; R. Gilman Brown, mining engineer; C. W. Purington, mining engineer; Col. Millard Hunsiker, representing American metal industries; Reginald Gillmor, consulting engineer attached to United States Navy Department; George I. Gay, civil engineer, statistician; Robinson Smith, publicist, Department of Food and Publications; Louis P. Sheldon, banker; Pierre Humbert, engineer; Joseph A. Nash, shipping department, Commission for Relief in Belgium; C. W. Hough, engineer, electrical director of J. G. White & Co.; I. N. Dessau, director of Sir John Jackson & Co. (Russia), railway construction; G. Lawson, merchant; Henry S. Mackay, mining engineer; A. J. J. Fifer, consulting engineer; George H. Short, merchant; R. McClellan, merchant; W. C. Burton, engineer, general manager, London Underground Ry.; A. F. Kuehn, mining engineer; J. T. Clarke, architect; H. D. Hunter, railway engineer; E. Sengier, engineer, Commission for Relief in Belgium; G. I. Benenson, financier; R. Grant, Jr., banker; E. A. Brayley Hodgetts, secretary Nobel Dynamite Trust; F. W. Baker, financier; Edward Hooper, mining engineer; G. H. Thurston, mechanical engineer; Thomas Plunkett, financier; L. L. Tweedy, financier; Edward Walker, editor, *Mining Magazine;* H. R. Keene, manager, Allis-Chalmers Manufacturing Co.; A. F. Martin, airplane engineer, Conrad Hall & Co.; A. Holm, timber merchant; R. Peacock; C. Titcomb; R. Martens; D. P. Campbell; M. de Witt Mackenzie, Associated Press (of America); Leslie Urquhart. The Executive Committee consists of W. B. Poland, Millard Shaler, L. P. Sheldon, D. P. Mitchell, H. S. Waite, A. O. Cautley, C. W. Purington, Col. J. W. Boyle, Col. Millard Hunsicker.

The following list comprises those engineers, resident outside of Great Britain, who are members of the committee in a consulting capacity:

In the United States: Herbert C. Hoover, W. L. Honnold, Edgar Rickard, T. J. Hoover, T. A. Rickard, W. R. Ingalls, H. H. Knox, Philip Argall. In Russia: J. P. Hutchins, Petrograd; W. E. Thorne, Bodaibo, Siberia; Norman C. Stines, Ekaterinburg; R. Chartran, Bodaibo, Siberia; R. E. Smith, Vladivostok, Siberia. In Spain: N. B. Knox, Noya, Coruna.

Engineer Services Organized

The extent to which the services of engineers will be utilized in the war is emphasized in the Army general orders recently issued. They are, in effect, as follows:

Each army, consisting of three corps, will have a special engineer regiment of one colonel, one lieutenant colonel, three captains and 38 enlisted men in the headquarters division, and six companies, with six officers and 250 men each, whose business it will be to handle the "gas and flame service." In addition each army will have regiments for the following services: A mining service of six companies, a water-supply service of six companies, a general construction service, an engineer-supply service of three companies, three workshop companies and one service battalion; also a battalion of topographical engineers to provide a surveying and printing service; a road service detachment with three road engineer companies and six service battalions of four companies each; 10 motor truck companies of 31 trucks each and five wagon companies with 61 wagons each.

On the line of communications of each army will be a pontoon park with six construction battalions and six service battalions of engineer troops, two supply battalions, two workshop battalions and three supply-service battalions, 10 battalions of forestry engineers supplemented by nine service battalions for this work; two battalions of special quarry service troops with three supplemental work battalions; five battalions of railway engineers for light railway service, supplemented by three work battalions; four battalions of railway engineers for the operation and mechanical department, supplemented by three service battalions.

A standard-gage railway service is to be maintained by five regiments of special railway engineers, with eight supplemental work battalions. For line of communications work there will be a separate standard-gage railway contingent. Six battalions of railway engineer troops will be detailed for operations with three service battalions and one regiment, and one supplemental engineer battalion and one service battalion in the mechanical and supply department.

Only 10% of the railway operating and shop troops, forestry troops and service battalions will be armed except during their training period.

Arsenals Used Free-Sulphur Formula Against Expert Advice

Testimony before the House Investigating Committee, in reference to defective ammunition sent to Gen. Pershing, disclosed that although ammunition experts had advised against using a free sulphur formula for the Government's ammunition primer, the opinion of the War Department was set in favor of such a formula. "The technical opinion of the world was against us. All our people believed in it, though," said Col. George Montgomery, U. S. A., commandant of the Frankford Arsenal. It is said, moreover, that Col. Montgomery went so far, upon one occasion at least, as to request of Brig. Gen. William Crozier, the chief of ordnance at Washington, that a fulminate of mercury primer be adopted in place of the sulphur primer. Gen. Crozier claimed that, while he knew of this recommendation, it had never been brought to him officially for action, intimating that a subordinate had shelved the report.

"Evidence that the sulphur primer was not accomplishing its function first appeared in January," says the New York *Sun*. "The percentage of hangfires and misfires, however, was not so great as to cause alarm, and, although investigation was commenced, it was not until May that Col. Montgomery, in the light of his previous experience, felt justified in recommending the suspension of sulphur primer manufacture. This was after it had been discovered that 10% of the small arms ammunition made and issued since January either hung fire or missed fire." Testimony showed that 8,000,000 sulphur primers had been condemned since the defect was discovered. The old free-sulphur formula is being used in artillery ammunition with perfect results because it ignites a quick-burning black powder, whereas in small arms ammunation the bullet is shot from the gun by a slow-burning powder.

Chemists Solve War Problems

When war was declared with Germany, this country was practically destitute of optical glass, needed especially for periscopes, range finders, field glasses and other instruments. This was stated by Director Arthur L. Day, of the Geophysical Laboratory at Washington, D. C., in presenting a paper on "American-Made Optical Glass" at the recent meeting of the American Chemical Society in Boston. The manufacture of this material was largely confined to France and Germany, in which countries it was a secret process. France could spare none, and no one here knew how to make it. The Geophysical Laboratory and the glass men of the country attacked the problem three months ago; today they are in a position to state that a sufficient supply of the six varieties needed for all branches of the service will be provided. It is promised that 45,000 lb. of it will be produced next month.

Two other problems were solved, said Prof. Julius Stieglitz, president of the Society, in "the invention of devices for safeguarding submarines against internal explosions of storage batteries and in the discovery of antidotes to the poison gases used by the Germans. We must never again be dependent on foreign countries for the manufacture of the basic elements of our chemistry."

Improvement of Waterways

While it will take long to improve all inland waterways that could be made navigable in connection with development of water power, yet every 100 miles helps, says H. J. Pierce, of Seattle, Wash., and the construction of river-power dams will be begun in many sections of the country when Congress passes laws permitting safe investment of capital in water-power developments.

The inland waterways of the warring countries of Europe are being used to their utmost limit, and hundreds of miles of new canals have been built since the war began. A new waterway 182 miles long, connecting the Oder and the Vistula Rivers, has recently been opened to traffic, and 500-ton boats go direct from Berlin to Warsaw and to the seaport of Dantzig. Germany has

thousands of miles of canals and rivers that have been made navigable, and are being used for carrying heavy freight, leaving the railroads free to be used for the rapid transportation of troops and food supplies. Were it not for her freight-carrying inland waterways, Germany would have found the rapid movement of her troops from one front to another seriously impeded with the railroads occupied with heavy freight shipments.

During the time when railroads were extended more rapidly than traffic warranted, they naturally opposed river improvements, fearing water competition. But the roads can no longer handle the traffic offered them and welcome the passage of heavy freight by water. River steamers now act in most cases as feeders to them, gathering freight from points which they often do not reach and delivering it to them at terminals to be taken by rail to final destination. Transportation facilities are the very foundation of industrial prosperity, and the advantages of a complete system of internal land and water transportation is of incalculable advantage to any country.

Commission for Strike Problem

A commission to study labor unrest in the Far West has been appointed by President Wilson and has already taken up its work. The members composing it are: William B. Wilson, Secretary of Labor, who is chairman; Col. J. L. Spangler, of Pennsylvania; Verner Z. Reed, of Colorado; John H. Walker, of Illinois, and E. P. Marsh, of Washington. Felix Frankfurter will act as secretary to the commission. Col. Spangler and Mr. Reed are business men, while Mr. Walker and Mr. Marsh are labor men. Mr. Frankfurter is a special assistant to Secretary of War Baker, and has been acting in a confidential capacity in a number of labor disputes in which the War Department was involved.

This commission is to aid the state governments in developing a better understanding between employers and employees; to learn the real causes for discontent, to allay misunderstandings, and to show the active interest of the National Government in furthering arrangements just to both sides.

Government Control of Business

The control of business by the Government as provided for in the Food bill, may be presented under four heads, according to a bulletin of the Chamber of Commerce of the United States:

(1) Practices prohibited by the statute, and now illegal, such as (a) destruction of supplies for the purpose of enhancing price or restricting supply, (b) wilful waste, or wilfully permitting preventable deterioration, (c) hoarding, that is, holding or contracting for quantities in excess of reasonable requirements for use or consumption within reasonable time.

(2) Control by license to become operative upon order of the President and to the effect that no man may engage or carry on any such business as specified above without a license from the President.

(3) The third means of control exists with respect to wheat, flour, meal, beans and potatoes; the President is authorized to purchase, store and sell.

(4) The fourth method exists in the President's powers of requisition, to secure an adequate supply of the commodities specified in the law, for the army or navy or for any other public use connected with the common defense.

This statement of some of the provisions of the law has been sent to members for their information.

To Avoid Export Congestion

To prevent congestion of export traffic at ports and in yards of seaport lines, a committee has been formed to coördinate the activities of the railroads and of various Government departments concerned. It is known as the "Coördinating Committee on Exportation" and has been created at the instigation of the Railroads' War Board. The committee will consist of a representative from each of the following: General Staff, U. S. A., the traffic executive of the Allied governments, the Shipping Board, the Food Administration, the Red Cross and the Car Service Commission as well as of the Railroads' War Board. Charles M. Sheaffer, of the Car Service Commission, is chairman.

First Standarized Ship Launched

The first standardized ship built to the order of the British Government recently completed her tests and has been put into commission. The keel was laid in February of this year. Hull, machinery and boilers are all standardized to secure quickest results at least expense. A special feature is the large hatchways, making the ship almost self-trimming, and greatly facilitating loading and unloading. Handling of cargo is further simplified by the large number of winches provided. In British shipyards two types of these vessels are being constructed, each of 8000 tons dead-weight carrying capacity. These are the "A" type, single deck, and the "B" type, two deck. Two smaller types, C and D, are contemplated, of 5000 and 3000 tons dead-weight respectively.

Tractors to Defeat U-Boats

Nine thousand motor tractors have been ordered by the British Food Production Department to carry through the scheme to add 2,000,000 acres to the arable land of the country in time for the harvest of next year. Up to the present nearly 1000 have been received from the manufacturers. Delivery of the others is expected at a rate which should place at the disposal of the Department 2500 by the end of October, 4500 at the end of the year, 7000 early in February, and the completed total of 9000 before the end of March. In placing orders for so many a generous margin for possible delay or loss in transit has been allowed. With 5000 tractors actually at work it is estimated that the desired new acreage can be broken up and cultivated in time to yield a crop.

President Appoints Joseph P. Guffey Petroleum Administrator

Joseph P. Guffey, of Pittsburgh, has been appointed Petroleum Administrator for the Government to cover the purchasing and obtaining of petroleum and petroleum products for the United States and the Allies both in this country and abroad. Mr. Guffey is general manager of the Philadelphia Co., controlling the Philadelphia Oil Co. He is also state chairman of the Democratic party. He will be associated with Dr. Harry A. Garfield, Fuel Administrator, and is expected to open offices in the Munsey Building in Washington.

Industrial News from Washington

BY OUR SPECIAL CORRESPONDENT

Potash Bill Passes the House

The potash bill passed the House on Sept. 21 with the committee amendments. There was little objection to the measure. A digest of the bill prepared by Representative Ferris, the chairman of the Committee on Public Lands, is, in part, as follows:

Sec. 1 of the bill authorizes the Secretary of the Interior to issue prospecting permits to citizens of the United States covering areas of not to exceed 2560 acres in any one case for the purpose of exploring for potash on public lands. The life of such a permit is not exceeding two years. Land in and adjacent to Searles Lake, Calif., is excepted from the provisions of this section because it is well known and is ready for development and requires no prospecting work to be done.

Sec. 2 authorizes the prospector, under the permit described in Sect. 1, upon discovering a valuable deposit of potash, to obtain a patent for not exceeding one-fourth of the land in the permit. This provision is designed to induce exploration for this valuable substance which might otherwise not be had, as these deposits, if found, are likely to be in arid desert basins, the prospecting of which is an arduous and expensive matter. Sect. 2 also provides that all the lands in any prospecting permit not so patented shall be subject to lease by the Secretary of the Interior in areas not exceeding 2560 acres, conditioned upon the payment of moderate royalty. The leases are to be indeterminate, but the Secretary of the Interior is authorized to readjust the terms and conditions at the end of each 20-year period.

Specific reference is made to the known deposits of potash in and adjacent to Searles Lake, and it is provided that they may be operated by the United States or may be leased by the Secretary under the terms and provisions of the act. There are now two small plants for the manufacture of potash located on the shores of this lake, and several other persons or corporations have indicated a willingness to take leases should this bill become a law. Railroad facilities are already provided, and early development of this deposit seems assured if the bill should become a law. Provision is also made in this section for the leasing of certain known potash deposits in rock in Sweetwater County, Wyoming. These lands also contain valuable deposits of coal, and the bill provides that the potash may be leased under the provisions of the act on condition that the coal be reserved to the United States.

Sec. 3 authorizes the Secretary to permit the use by any permittee or lessee of not exceeding 40 acres of unoccupied non-mineral public lands for camp sites or refining works in connection with any permit or lease.

Sec. 5 is designed to prevent monopoly or interlocking stockholding interests; limits any lessee from holding more than one-tenth interest in any other agency engaged in the sale or resale of potash products, and provides for appropriate forfeiture proceedings in the United States court for violation of the provisions of the section.

Sec. 10 provides for the disposition of royalties and rentals under the act. They are to constitute a part of the reclamation fund for the irrigation of arid lands in the Western States, and, upon return to the reclamation fund after such use, 50% is to go to the Treasury of the United States, the other 50% to be paid to the state within the boundaries of which the deposits are or were located, the money to be used by the state for the construction and maintenance of public roads and schools.

Sec. 13 directs the Secretary of the Interior to incorporate in every lease issued a provision reserving to the President the right to regulate the price of all minerals extracted or sold from the leased premises, the price to be fixed so as to yield a fair and reasonable return to the lessee and to secure to the consumer any of the products at the lowest reasonable consistent price. A proviso to the section also vests in the President authority to regulate the disposal of the potassium products so as to secure their distribution and use wholly within the limits of the United States or its possessions.

Comments on the Copper Price

Difficulties occasioned by having fixed too low a price on coal are thought to be responsible for the fixing of the price of copper at 23.5c. per lb. One higher than 22c. is said to have surprised the Federal Trade Commission, which had been charged with the task of ascertaining the production costs. That the President should have fixed the price 7c. higher than that at which 32 contributors voluntarily supplied the Government with 48,000,000 lb. of copper is deemed to bring out with great clearness the generosity of the producers. It also substantiates the assertion that the price of 16⅜c. was set without considering economic facts and was simply the manifestation of patriotic desire to be the first industry to come forward directly to help the Government and thereby set an example that others might follow. It also served to notify the speculator that any effort to accumulate copper supplies would be made at his risk. It had the further advantage of enabling the Chief of Ordnance to utilize the services of all manufacturers who could not bid unless the Government furnished the copper.

This coöperation of the copper men in such an open, altruistic manner has won the favorable comment of members of the Federal Trade Commission, the War Industries Board and the Council of National Defense. Particular credit is given to John D. Ryan, Murry Guggenheim, James McLean and Rodolphe L. Agassiz. Praise has also been given T. Wolfson, who, as secretary of the Defense Council's copper committee, bore the brunt of the hard work occasioned by the lengthy negotiations. It is said that the copper interests have taken no offense at any demand that has been made upon them. All requirements have been filled promptly on memoranda, pending the fixing of price. The Trade Commission, in particular, is gratified at the reception given its agents who investigated cost figures. In most cases the companies furnished all the clerical assistance that the examiners could utilize. In no office visited was there any tendency to hamper the work of the Commission's representatives. In fact the spirit of coöperation was so generally manifest and so little selfishness was apparent, that an official declared that an equivalent amount of patriotism on the part of the public in general would add mightly to the strength of the nation.

More Platinum from Colombia

Platinum production in Colombia is expected to increase materially during the coming year. Prospecting has shown that the metal occurs in the stream gravels and in the high gravels for long distances on the Atrato and San Juan Rivers in the Department of Choco. The most important operations are those of the South American Gold and Platinum Co. along the Condoto River, and the numerous native washings in the vicinity of Istmina.

Editorials

Copper to Everybody at 23½ Cents?

THE morning papers of Sept. 21 contained the announcement that the War Industries Board, with the sanction of the President, had determined upon a price of 23½c. per lb., f.o.b. New York, for copper after agreement with the producers, that price to be subject to revision after four months. It was said further that as conditions with respect to this price the producers had agreed not to reduce wages, to supply the Government, the Allies and the public at the same price, to maintain production at the maximum and to keep copper out of the hands of speculators. Incidentally the W. I. B. brandished the big stick and said that if the producers fail to do those things the Government will take over their mines and plants.

Several things stand out in this statement. In the first place there has been another surrender to labor. Capital is directed to be self-sacrificing. Labor is protected. (Is there an implied obligation on the part of the W. I. B. to see to it that labor does not make unjust demands during the four months in question? If so, we fail to notice any such guarantee.) In the next place the President had no direct authority in this matter although he had implied powers that would have enabled the same ends to be accomplished, but anyway his sanction had to be obtained in order to quiet the several discordant and controversial elements in the Government.

As for the price itself, 23½c. is not unreasonable. Previous to the war we had taught ourselves to regard 14½@15c. as an average price reasonably to be expected. The general inflation—the increased cost of production, or however the inflation may be expressed—is probably about 60%. If that figure be correct, a present price of 23½@24c. would correspond to 14½@15c. before the war. When Washington talks about the market price having been 36c. a few months ago, about the producers having been willing to sell to the Government at 16⅔c., and about the cleverness of the W. I. B. in cutting the price from 36c. on the one hand, and its generosity in raising it from 16⅔c. on the other, it is the cheapest kind of buncombe and claptrap. The major market for copper was never as high as 36c. The producers made their big sale to the Allies last October at 25c. The average realized by them for all their sales in 1916 was about 25c. The quotational average for the year was 27.2c. When, last spring, negotiations were opened between them and our Government they asked 27c., and were willing to take 25c. Now, after all the delay, uncertainty, controversy and upsetting of business, the outcome is a price of 23½c. Was the difference of 1½c. worth the while? The difference becomes even narrower when it is considered that from one-fourth to one-half the net profit of the producers is to be taken by the Government in its excess profits tax.

But the matter of price, as between 23½ and 25c., is the least important thing in Washington's program. The vital matter is the reiteration of the theory of one price for all and the threat of force unless it be granted. It is said that the producers agreed to this. We may imagine their assent as being given while they were under duress. They could readily agree to keep copper out of the hands of speculators, for they do that anyway, it having been an ancient policy of the leading producers to sell to none but consumers. But how can they give copper at the same price to everybody if they have not the copper to give? What is the manufacturer of electrical apparatus, of lamps, of pins, of tacks, of rivets, etc., going to do if he asks for copper at 23½c. and is told that there is none for him? Suppose he says that he will give 24, 25, 26 or even 30c. if some can be diverted to him and the producer replies that it cannot be done else his mines will be seized? But suppose the consumer goes to a seller of copper from mines in Cuba, Peru, Chile or Spain, what will Washington do about seizing those mines? Or suppose he goes to a seller of copper reclaimed from scrap and there are no mines to be seized? How are consumers, who happen to be oversupplied, going to be prevented from reselling at their own price? Fortunate will be those manufacturers who have provided for their requirements by average-price contracts. Unfortunate will be those who have contracted to deliver finished goods at prices based on the quoted price for copper and have not provided for their raw material.

There will be two prices for copper, viz., the official price to the Government, the Allies, and such consumers as are favored or lucky, and a competitive price established by the bidding of the unlucky consumers for the uncontrolled copper. Their competitors in Great Britain will have the advantage over them, for they will get their copper through their governments at the cut price. Of course this is on the assumption that the supply of copper is going to be short. If the supply be in excess, something different will happen. We are of the opinion, however, that unless demand experiences a sharp contraction the supply of copper during the next four months is going to be short. In this connection it may be remarked that everybody is apparently going to be in the dark respecting the Government and Allied requirements, i.e., everybody except those buyers and the producers who are supplying them. However, perhaps the producers will continue in the darkness wherein they stand at present and will never know how much they may safely release to consumers.

How is priority in the industries to be determined? The trade has heretofore attended to that automatically through a system of premiums for early delivery, but hereafter there will be but one price. The continued existence of such premiums up to last week, in spite of the absence of general buying for a long time past, is in itself an indication that the copper supply is short. When the supply is abundant there is no premium.

The Government did not need any promise from the producers that they will maintain maximum production. They would not be so unpatriotic as to curtail production out of pique and they would naturally produce all they could so long as they did not incur loss. Let it be noted, however, that the negotiations, studies of cost, etc., have been confined to the large producers and have taken no account of the position of the scores or hundreds of small producers whose copper, considerable in the aggregate, passes through many hands. They are supposed to follow the lead of the big fellows. The question is: Can they? And if they cannot, their men will not necessarily become available to the more economical producers, for the latter may not have the plant in which to use them. The wiseacres who figure the margin between market price and bookkeeping cost of production overlook that what seem like stupendous profits have gone to a large extent into plants to supply the increasing production that is required and that such outlay may have to be amortized at 100% or 50%, which makes the real cost of production a very different thing from what it appears on books kept in the ordinary way. This is why many industrial companies that are supposed to have made enormous war profits are now in financial difficulties, and why many more are contemplating the necessity of borrowing money in order to pay their taxes for 1917. Manifestly the theory of Washington is not going to encourage the risking of money in new plants.

Until more is known respecting the notions of the War Industries Board about the copper business we cannot discuss the situation very well. We doubt if the W. I. B. itself knows what it has done or is going to do. On the face of things the W. I. B. has commandeered for the Government an option on copper at 23½c. for the next four months. The producers are threatened if they do not obey. The Government has the first call on copper for its own requirements; then for the Allies, including their consumers; if any remains it is for the American consumer. If none remains the American consumer must go without unless he can buy it abroad. Suppose, however, there should be a surplus. Is the producer to charge for it at 23½c. although he might be willing to sell it for less?

Then there is the contract system on which the copper business is based. The manufacturer takes a contract to deliver an order of sheet copper during the next three months and covers himself by an order for cakes from the refiner for the same period. What is going to be done about such business while the Government has an unlimited option? What is going to be done by the buyer of copper in raw material, often from remote countries, which may not be deliverable as refined copper for many months after its purchase? Is not there great danger that our important supply of imported copper will be seriously curtailed?

The Government's edict abolishes the trade custom of selling to consumers on the basis of "delivered, 30 days," the seller paying the freight to the buyers' works and waiting 30 days after delivery for payment. The buyer will now have to pay his own freight and presumably will have to pay cash, but as to the latter nothing has been said officially.

Contracts for the delivery of copper in the first quarter of 1918 have already been made. Are we to have an open market on such business? When is the Government going to consider its next quarter's business, which even now is not very far ahead?

In a natural market these things take care of themselves. With a price-fixed market nobody can foresee what is going to happen. It is as if a giant had suddenly deposited snags in a smoothly flowing river.

The attitude of Washington with respect to price fixing appears to be that the experts in the several industries are wrong, even if they are not swayed by selfish and unpatriotic motives, and that the only way that it can be satisfied that water cannot be made to run uphill is to try to make it do so. The attitude of the copper producers is that they do not believe it can be done, but they are going to try loyally to help Washington in what Washington wants. No difference of opinion, no injury to individuals, is going to stand in the way of working unitedly for the country.

The Iron and Steel Prices

ON SEPT. 24 the War Industries Board announced its fixing of the prices for coke, iron ore, pig iron and certain steel products. These prices were arranged by agreement with the producers on conditions similar to those that were imposed on the copper producers. As in the case of copper, the iron and steel producers also express satisfaction with the prices. The parallel is further extended by there being the same absence of consideration of the organization of the business and the same leaving to the producers the matter of working things out. The War Industries Board is apparently imbued with the amateurish idea that the price for a commodity is all there is about it, and is ignorant of the delicate organization of any complicated business and the fact that a natural price is the final expression of many intricate pieces of mechanism. Let a computing machine be set in one way, it produces a certain number. Change the setting, and all the cogs and levers, working together, produce a different number. The War Industries Board pitches a crowbar into the copper machinery and another one into the iron and steel.

Again, as in the case of copper, the reductions in the prices for iron and steel were not so much as is represented. The iron and steel market, as quoted for several months past, has been virtually a fictitious one, in that quotations did not represent large transactions. Belated consumers and those who needed some supplies in emergencies did indeed have to pay fancy prices, but such did not represent what consumers were paying or producers were getting for the bulk of the supply. Yet the Committee on Public Information (Mr. Creel's Committee), which issued the official statement, published therein a table showing the enormous cuts that the Government had made in the interest of the public by comparing the new prices with the non-representative prices that have been made on small and emergency business. This is precisely analogous to the misleading representation that might be made if the Government had reduced the price of theater tickets in New York to $1.75. The market price is $2 and the bulk of the transactions are at that figure, though not a day passes when a few are not sold to belated and insistent buyers at $3. The War Industries Board would herald such a maneuver as a cut—not from $2 to $1.75, which

would be the truth—but as a cut from $3 to $1.75 and would point out how cleverly and ably it had looked out for the public welfare, which would be buncombe passed out to the people in the hope that they would swallow it. Most of them would not in the matter of theater tickets but would in the cases of copper and steel, whereof they are not well informed. It is unhealthy when Government bureaus indulge in such deliberate misrepresentation.

Quotation of the Copper Market

LARGE business in copper is done on the basis of the market as quoted by the *Engineering and Mining Journal*. Ores and bullion are so bought from miners and smelters. Refined copper is so sold by refiners to manufacturers and by manufacturers to ultimate consumers. In some states the taxes on mines are computed on our average.

On Sept. 21 the Government announced an arbitrary price by which producers agreed to abide, and said, furthermore, that if it did not do so their mines might be commandeered.

We believe there will continue to be a free but circumscribed market in which the quotations may be higher or lower than the Government price. We see nothing for us to do, however, but to adopt the Government price as our quotation, and assist the Government's purpose. If the producers who sell directly are required to supply consumers at 23½c., those consumers who have contracts on the basis of our quotation cannot equitably be expected to pay anything different. Nor can those smelters and refiners who buy copper in ores and crude form be expected to pay more or less than the price at which the Government requires them to sell. Nor can states expect to collect taxes on any different basis.

As to the extensive labor contracts between copper companies and their workmen, they have been abrogated. Not so, however, the contracts between zinc-mining companies, gold- and silver-mining and others that are based on the price for copper. This is a matter that they will have to settle as best they can.

There may be some injustice done in the relations between foreigners and Americans and in the relations among foreigners alone, but if so we do not see how we can help it.

If there develop a competitive market, circumscribed though it may be, we shall naturally report it, but until further notice our official quotation will be the Government price.

New mining and milling machinery, electrical equipment, structural steel, etc., is at present extremely difficult to obtain, especially by the smaller buyers. The purchase and use of second-hand machinery and equipment has, as a consequence, been given greater attention than heretofore and small plants are now using discarded and renovated grinding mills, concentration tables, engines and machines of all sorts successfully when purchased and remodeled by competent engineers. The market in second-hand mining and metallurgical supplies is therefore of considerable interest; and a cataloging of such material available, giving the necessary details, would prove of great value.

BY THE WAY

Matthias Erzberger, who came recently into prominence by his advocacy of peace in the German Reichstag, has been dropped from his office as director of the Deutscher Kaiser Mining Co., which is controlled by August Thyssen, the well known steel millionaire. Herr Erzberger's program of "peace without annexation" was extremely distasteful to Thyssen and the other Rhenish steel operators, who want to see Germany retain control of the Belgian iron mines and of the minette-ore deposits of Lorraine and the Briey Basin in France. The loss of this office, it is said, will deprive Erzberger of a large part of his income, which will, perhaps, put him into a warlike mood.

The recommendations of Mr. Thomas, the labor representative on the British Mission to the United States, to the committee on labor of the advisory commission of the Council of National Defense are worthy of serious consideration both by employer and employee. Predicated upon his British experience, he suggests: "Let the employer say: 'I am not desirous of taking advantage of the war to break down something that I never believed in.' On the other hand, let the employees say: 'While anxious to maintain the law, we are not anxious to take advantage of the war to enforce some thing during the war that we could not obtain in peace times.' With both sides recognizing that, I repeat, I believe they will find a solution."

Washington evidently dropped a stitch in the recent price fixing. The selling price of coal, copper, iron, coke, wheat, etc., was fixed at various points, and notwithstanding the fact that these prices were not entirely satisfactory to producers, "big business" has loyally stood behind the Government, even to the point of protesting that the prices were "fair" and "pleasant to take." But fixing the price of a product without fixing the cost of the elements entering into its production gets us back to the same old system—raising the price as the cost of production rises. Now the bituminous-coal miners are demanding a 20 to 70% increase in wages, while the price of the product remains fixed at a $2 base, which has already curtailed production.

How are the mighty fallen! East Rand Proprietary—one of the biggest and formerly one of the best mines on the Witwatersrand—announces but a three-figure profit for August—namely, the ridiculous figure of £100, says the London *Financial Times*. No farther back than January the company netted £30,000 in a month, while seven or eight years ago, in the early days of the combined undertaking, the monthly profits almost always ran into six figures. The official cable palliates last month's "catastrophe" by explaining that there is at present an acute shortage of native labor; the mine has only 68% of its complement of underground "boys." But the root cause of the trouble is, of course, the disastrous falling off in development results in the upper half of the property in recent years. The future depends mainly on the chance of a fresh payable mine

being opened up in the lower (southern) half of the company's large area, but this at best will take six or seven years and a large expenditure of money to bring to the producing stage. It is probable that the interests of all would be better served by suspending production now until after the war, when the labor supply and working expenses become more normal. By the way, the East Rand Proprietary does not, of course, belong to the Far East Rand group of properties which has recently been so popular, there being a big break geologically between them.

The central span of the great cantilever bridge at Quebec was successfully bolted into place at 3:28 p.m., on Sept. 20, thereby closing the gap across the St. Lawrence and practically completing the largest bridge of its kind in the world. This span weighed 5400 tons and the structure was lifted 150 ft. into place by hydraulic jacks from pontons after having been floated down the river for a distance of 3½ miles. Recalling the disaster of 1907, when a hundred men were dragged into the river with the collapsing south end of the original structure, and again the catastrophe of last year when the slipping of a link caused a span similar to that just lifted into place to fall into the river a complete wreck, sacrificing 14 more lives, the final success must be hailed as a victory for the builders who out of a two-fold failure have justified their prediction that the bridge could be completed as planned.

Enticed by an advertisement reading "Mining machinery for sale, apply to manager of Sonapet Zemindary, via Amda Ry. Station," a mining engineer in India writes: "Just at that time, I was on the lookout for some machinery, so decided to have a look at the things. Accordingly, with the master-mechanic of the mines went by rail to Amda, arriving there only a few hours or so late, at 11 p.m. On making inquiry at the station, nobody seemed to know just where this Sonapet lay, though three or four men agreed that it was some sixteen miles in the jungle, and the only way to get there was by bullock cart. This began to look interesting to one new to Indian ways, so a driver and cart with two buffaloes were obtained and the station officials were asked to explain in the local dialect just where we wished to go. It was a magnificent moonlight night so we did not anticipate any difficulty; accordingly, we made our beds in the cart, which was so short that our feet stuck out of the back (one always takes one's bedding when traveling in India) and lay down to sleep. These carts have no springs of any kind, and the drivers are not particular whether they keep to the road or not, so it may be imagined how much sleep was obtained. All proceeded well until it began to get daylight and we asked the driver in Hindustani where we were. As his replies did not appear too satisfactory, we asked him where he was taking us, and he replied, 'Into the jungle.' After much crossquestioning, he admitted that he did not know where he was going! At that, our remarks to him were . . . (deleted by censor—would not be understood by the mining profession anyway) and one could imagine the blush which must have come under his black skin. A village was near, so it was decided to get down and ask the villagers our route. On alighting, the buffaloes took a look around and must have been alarmed at the sight of white faces and European clothing, for they bolted, turning over the cart and sending lunch basket, foodstuffs, bedding, etc., flying in all directions. Finally a large tree brought them to a standstill, but not for long, as they soon broke away from the cart, and the last we saw of them, they were well on the home trail, with a *Bail-Gharry-Wallah* yelling anathemas after them in some strange dialect. It took much persuasion to get the villagers to lend us two bulls to take us back to the station, but finally this was done and we returned too late to start out again, so we spent the day in making arrangements for two good bulls and a man who really knew the way and at 11 p.m. we started again. This driver persisted in walking the bulls on the level, and making them run helter-skelter down rocky hills. To make the bulls run, the driver usually takes a tail in each hand, and gives it a good twist; this has the desired effect. On one of these little expeditions he drove the cart over the side of a steep bank, which would have smashed any ordinary cart, but we got nothing more than a shaking, while the driver trilled happily to the bulls, and we went merrily on our way. At 4 a.m., after five hours of steady travel, we asked how far we had to go and were told, 'One mile.' This mile took until 6:30 a.m., and long before that we were not on speaking terms with the driver. Arrived at the mines, there was nothing suitable for our works, so the return journey was made, and Amda was reached at 5:30 p.m., after 18½ hours' steady travel. I trust that the expeditions of engineers in the States are more fruitful."

There is one bit of unpublished history, says John Hays Hammond, in the *American Magazine*, that will show how near Cecil Rhodes came to controlling the copper output of the world. The near coup was scheduled for 1895. By this time the new gold mines of Rhodes in South Africa were pouring out millions and millions of dollars' worth of their precious product, and we could have raised $200,000,000 or $300,000,000 of capital without trouble. The memorable Secretan Copper Syndicate, which aimed at buying up the bulk of the world's stock of copper and boosting the price, had collapsed ignominiously some time before this. The brilliant but erratic Frenchman had gone about things the wrong way. Now that Rhodes had managed to establish control of the international diamond business, he became interested in the idea of acquiring control, not of finished copper, but of all the principal copper mines of the world, so as to be able to regulate output and price. Rhodes succeeded in interesting the Rothschilds, who controlled the great Rio Tinto mine as well as another large mine in Mexico. Alfred Beit was also behind us, as were all the resources of the DeBeers and the Consolidated Gold Fields—the whole representing hundreds of millions of dollars. I laid out plans at Mr. Rhodes' request, for control of Anaconda and other American properties, and the scheme was so far advanced that I was to leave for the United States early in 1895 to complete the American end of the deal. Unfortunately, the Jameson Raid came on. I was in prison for six months, and then Rhodes went to Matabeleland to quell a serious uprising of natives in that territory. So the whole gigantic plan fell through.

Butte & Superior Flotation Case

When asked regarding the policy of the company in connection with the judgment recently entered against it by Minerals Separation, Bruce MacKelvie, president of the Butte & Superior Mining Co., informed a representative of the *Boston News Bureau* substantially as follows: "We did not really expect any other outcome of the case in the district court, as we had always expected that the real contest would be made before the circuit court of appeals. We were, of course, surprised that the judge went as far as he did in view of what our attorneys had advised us was the effect of the Supreme Court decision and the decision of the circuit court of appeals in Wilmington in the Miami case. If the judgments of those courts construed by the best legal advice we can obtain has been followed, we are and for many months have been operating entirely outside the terms of the Minerals Separation patent, but this matter will now be submitted by appeal to the United States circuit court in San Francisco at the eariest date it is possible to obtain a hearing there. The appeal is now being perfected.

"As a condition of continuing operations Judge Bourquin requires the company to file a bond of two and one-half million dollars and to deposit all future earnings in court. Surety companies that have been approached in the matter and made familiar with the nature of the company's assets will not issue a bond, as it is evident that current assets of any mining corporation are largely represented by inventory and metals in process and in transit; so that Judge Bourquin has imposed upon this company the closing down of its mine at a time when the country is at war and requires the maximum production of metal. The same protection could be granted the Minerals Separation Co. by the court through a modified order providing that in addition to having all future earnings paid into the court the assets should not be disbursed. Under such a plan the assets of the company will be held intact pending a final accounting."

Assessment Bill Passes House

WASHINGTON CORRESPONDENCE

But three votes were cast against the Annual Assessment bill when it came up for passage in the House on Sept. 21. The bill has already passed the Senate and, though important substantial amendments were made by the House, it is believed that the conferees can easily reach an agreement. Representative Mondell, of Wyoming, introduced an amendment exempting oil-placer locations from the act. Representative Taylor, of Colorado, justifies the passage of the bill on the following grounds:

1. On account of scarcity of labor and the actual inability to procure men to do this year's assessment work.
2. Because a great many prospectors and miners have enlisted in the army and navy and many others are being drafted.
3. Because mining development, especially in the way of prospecting and new discoveries, is practically at a standstill at the present time, and the exceeding high cost of powder, steel and other materials makes assessment work almost prohibitive.
4. Because approximately 90% of all the assessment work done is virtually dead work; that assessment work does not bring about practical development; and during these times it is looked upon as unreasonable and wrong to require any useless or unproductive expenditure of either labor, money or materials, and that wasted energy in any direction should not be required in these war times.

While the opposition was small, a determined fight was made by Representative Walsh, of Massachusetts, who did not consider it a war measure. He expressed the belief that corporations holding a large percentage of mining claims could secure the labor to do the assessment work if they would pay a proper wage. He maintained that the precedent of exempting claim holders from the 1917 assessment work would be made an excuse for similar exceptions in future years and perhaps indefinitely, thus retarding the mining industry greatly.

Government Fixes Prices for the Steel Industry

WASHINGTON CORRESPONDENCE

By fixing the price of steel plates at $3.25 per cwt. and that of iron ore at $5.05 per ton, the Administration has dealt more liberally with the steel industry than had been anticipated. Steel men who had closely followed the trend of the negotiations with the War Industries Board did not expect the price to exceed $68 per ton. The price of coke is $2 higher than had been expected by the coke men themselves. With coke at $6 an incentive is offered to use coal at present prices in its manufacture. The official statement follows:

The President has approved an agreement between the War Industries Board and the steel men, fixing the following prices, which become effective immediately and are subject to revision Jan. 1, 1918, namely: Iron ore, lower Lake ports basis, $5.05 per ton; coke, Connellsville basis, $6 per ton; pig iron, $33 per ton; steel bars, $2.90 per cwt.; shapes, $3 per cwt.; plates, $3.25 per cwt. The prices of bars, shapes and plates are on a Pittsburgh-Chicago basis.

It was stipulated, (1) that there should be no reduction in the present rate of wages; (2) that the prices above named should be made to the public and to the Allies, as well as to the Government; and (3) that the steel men pledge themselves to exert every effort necessary to keep up the production to the maximum of the past so long as the war lasts.

Measures will be taken by the War Industries Board for placing orders and supervising the output of the steel mills in such manner as to facilitate and expedite the requirements of the Government and its Allies for war purposes, and to supply the needs of the public according to their public importance and in the best interest of all, as far as practicable. A spirit of coöperation was manifested by the steel men, and no doubt is entertained that every effort will be made to bring the production as nearly as possible up to the extraordinary demands resulting from the war.

Negotiations to the end of fixing the prices have been in progress since May. More than 60 prominent men of the steel industry took part in the concluding discussion with the War Industries Board.

Nitrate Plant Site Not Selected

WASHINGTON CORRESPONDENCE

Delay in selecting a site for the Government nitrate plant is causing concern to those closely in touch with the nitrate situation. The Secretary of War has approved southwestern Virginia as the general region in which the plant is to be built, but difference of opinion exists as to the exact locality. The spot that seems most likely to be chosen will require the construction of some heavy bridges which, it is thought, will delay the operation of the plant for several months.

Personals

Henry F. A. Riebling is examining gold properties in Mohave County, Arizona, in Gold Basin.

William Wraith, general manager of the International Smelting Co., of Tooele, Utah, is visiting New York.

Edward O. Acker, metallurgist for the Bethlehem Steel Co. for the last 29 years, has resigned and retired from active work.

Dyke V. Keedy sailed from New York on Sept. 19 for South America, where he will spend several months in the Guianas.

Austin W. Hoy, recently European manager for the Sullivan Machinery Co., has been commissioned an officer in the British Artillery.

Edel Moldenke is now on his way to Burma, where he will do geological work for Burma Mines, Ltd., in the Northern Shan States.

J. R. Harbottle, general manager of Batopilas Mining Co., and **Walter M. Brodie** have been in Joplin, Mo., examining properties for the Batopilas company.

J. H. Devereux has become a member of the firm of Wilkens & Devereux, 120 Broadway, New York. The other members are H. A. J. Wilkens and W. B. Devereux, Jr.

James Nelson, in charge of the duplex department of the Bethlehem Steel Co., at Bethlehem, Penn., has resigned to return to the Algoma Steel Co. at Sault Ste. Marie, Ontario.

A. S. Howie, who has been connected with the Backus & Johnston copper properties at Morococha, Peru, is on his way to Scotland, via Panama and New York, to join the colors.

William Wearne, general manager of the Inland Steel Co., at Duluth, Minn., has been commissioned a captain in the Engineer Officers Reserve Corps and is now at Fort Leavenworth.

H. T. Harrison, for some years chief engineer for Corrigan & McKinney, of Cleveland, Ohio, has been appointed general manager for the firm. **J. Y. Blackwood** succeeds him as chief engineer.

Norman R. McLure, for three years chief engineer of the Phoenix Iron Co., Phoenixville, Penn., has resigned and formed a connection with the Taylor-Wharton Iron and Steel Co., High Bridge, New Jersey.

John R. Stanton, president of the Wolverine, Mohawk, Michigan and White Pine Extension companies, has left for Illinois after an extended visit to the properties. He was accompanied by Theodore Dengler, general manager of the mines.

Herbert Schmidt, formerly assistant engineer of the Mahoning Ore and Steel Co., of Hibbing, Minn., has been commissioned first lieutenant in the Engineer Officers Reserve Corps and is at the Fort Leavenworth training camp.

S. S. Freeman has resigned as general manager of the Carbon Iron and Steel Co., Parryville, Penn. He has been elected secretary and treasurer of the Port Henry Iron Ore Co. and the Lake Champlain & Moriah Railroad Company.

Prof. H. E. T. Haultain of the University of Toronto, has been appointed a vocational training officer in connection with the Military Hospitals Commission for educating returned soldiers for such work as they are capable of undertaking.

P. J. Moran, general superintendent of the Detroit Iron and Steel Co., Detroit, has been appointed general manager of the blast furnaces of the M. A. Hanna & Co., succeeding **Max McMurray,** who has resigned to become president of the Cromwell Steel Co. of Cleveland.

Kenneth Ross, superintendent of the Bonner lumber mill of the Anaconda Copper Mining Co., has been appointed a member of a committee of lumber experts who will name 21 commissioned officers of the second forestry regiment, to be known as the Twentieth United States Engineers' regiment.

A. D. Shankland has been appointed chief chemist of the Lehigh and Saucon plants of the Bethlehem Steel Co., succeeding **F. O. Kichline,** recently transferred to Lebanon, Penn. **Samuel Lewis** has been appointed chemist at the Saucon laboratory, succeeding **A. R. Hartzell,** resigned.

Ralph Stokes, who is well known in this country as a former employee of the Canadian Exploration Co., and also as a contributor to the "Journal," has been serving with the British forces since the beginning of the war. He was lately promoted to a lieutenant-colonelcy and is now Controller of Mines, First Army, British Expeditionary Forces.

Edwin F. Gray has resigned as general manager of the Consolidated Coppermines Co., Kimberly, Nev., but will remain with the company as a director and consulting engineer. **Robert A. Linton** has been appointed general manager, and **H. S. Munroe** is general superintendent. Mr. Linton retains the general direction of the North Butte Mining Co. in Montana.

Capt. George Dey, of the metallurgical staff of Broken Hill Associated Smelters of Port Pirie, N. S. W., is in New York, en route to Port Pirie. He left Australia in May, 1915, as company commander of Company B in the 27th Australian infantry battalion, 7th brigade. He participated in the Dardanelles campaign and later in the Somme drive. He was awarded the Italian silver medal for his brilliant work at Pozières, where he was wounded, losing his right arm.

Whitney Lewis, of the firm of Hager, Bates & Lewis, oil geologists and engineers of Tulsa, Okla., has been forced to withdraw temporarily from the firm on account of his enlistment in the U. S. Engineers. Messrs. Hager and Bates have invited **Prof. James F. Kemp** to join them during Mr. Lewis' absence and Professor Kemp has accepted. Professor Kemp is compelled to forego for some time sedentary work, and is happy in receiving the invitation of two of his old students and friends to be associated with them in the Mid-continental oil field on or soon after Oct. 1.

Obituary

George W. King, president of the Marion Steam Shovel Co., Marion, Ohio, died Sept. 9, aged 63 years. He had been connected with the company since its formation in 1884, and had been its president since 1904.

Elwood B. Blandy, secretary of the Alaska Mines Corporation, died in New York, Sept. 16, aged 63 years. He was well known in the iron trade, having been associated for a number of years with the late George H. Hull, and having represented M. A. Hanna & Co., Pilling & Crane and other prominent concerns.

Societies

Coming Meetings

American Institute of Mining Engineers	St. Louis	Oct. 8-13
American Electrochemical Society	Pittsburgh	Oct. 3- 6
American Iron and Steel Association	Cincinnati	Oct. 26-27
National Association of Purchasing Agents	Pittsburgh	Oct. 9-11

Arizona State Bureau of Mines is planning to give a series of demonstrations or illustrated lectures throughout the state during the coming year, that are intended to bring the bureau's work directly to the people of the state and stimulate mineral production and create greater interest in safety of workers. Three lecture tours have been mapped out, one through the southern and eastern parts of the state, one through the western and one through the northern section.

Exposition of Chemical Industries—The production and uses of ferro-alloy metals, especially in relation to the war, is to be the subject of discussion at a joint meeting of the New York sections of the American Electrochemical Society and the American Institute of Mining Engineers, on Sept. 27 at the Grand Central Palace, New York, where the exposition is taking place. Among the speakers scheduled are: C. S. Newcomb, who will talk on "Chrome Mining and Concentration"; W. B. Driver, on "Nichrome," and Sydney H. Ball, on "Ferromolybdenum." Dr. Colin G. Fink and Philip N. Moore, the presidents of the respective societies, are to give short talks; also, Dr. George K. Burgess, of the United States Bureau of Standards, who has recently been in France.

Institute of Metals (British) held its annual autumn meeting in London on Sept. 19. The following papers were presented: "Experiments on the Fatigue of Brasses," B. Parker Haigh; "Hardness and Hardening," Prof. T. Turner; "The Effects of Heat at Various Temperatures on the Rate of Softening of Cold-rolled Aluminum Sheet," Prof. H. C. H. Carpenter and L. Taverner; "A Comparison Screen for Brass," O. W. Ellis; "Further Notes on a High Temperature Thermostat," J. L. Haughton and D. Hanson; "Principles and Methods of a New System of Gas-Firing," A. C. Ionides; "Fuel Economy Possibilities in Brass Melting Furnaces," L. C. Harvey; "The Effect of Great Hydrostatic Pressure on the Physical Properties of Metals," Prof. Zay Jeffries; "The Use of Chromic Acid and Hydrogen Peroxide as an Etching Agent," S. W. Miller.

Industrial News

Mark B. Lamb has received orders from South America covering transmission machinery, conveyor-belt equipment, electrical transmission, pipe-line equipment and electric motors, amounting to $24,000.

J. L. T. Waltz, treasurer of the Bremer Waltz Corporation, 30 Church St., New York, is in St. Louis for a week or two, to be present at the starting up of the company's new aluminum-sheet rolling mill. The mill has a capacity of 5000 lb. of sheets per day.

Powdered Coal Engineering and Equipment Co., of Chicago, announces that Norman L. Warford, engineer in charge of construction for the company, sailed from New York on Aug. 31 to take charge of the coal-pulverizing and copper-smelting department of the Société des Mines de Cuivre de Catemou, at Catémou, Chile. Mr. Warford was the designer and first operating superintendent of the installation of the Anaconda Copper Mining Co., at Anaconda, Mont., where about 1000 tons of powdered coal per day is used in reverberatory furnaces. He was with the Anaconda company from Dec. 1, 1913, until Nov. 1, 1916, when he went with the Powdered Coal Engineering and Equipment Co. He has been using powdered coal since 1897, principally in cement manufacture.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkalies—Process of Recovering Alkalies from Cement Materials. Spencer B. Newberry, Baybridge, Ohio. (U. S. No. 1,239,616; Sept. 11, 1917.)

Alumina — Manufacture of Crystalline Fused Alumina. Frank J. Tone, Niagara Falls, N. Y., assignor to Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,239,984; Sept. 11, 1917.)

Alunite—Method of Treating Alunite. Frank K. Cameron and John A. Cullen, Washington, D. C. (U. S. No. 1,239,768; Sept. 11, 1917.)

Basic Brick. Harry A. Kennedy, Clearfield, Penn. (U. S. No. 1,240,148; Sept. 11, 1917.)

Boreholes—Apparatus for Ascertaining the Direction of Boreholes. Carl Lorens Carlson and Gunnar Bergström, Stockholm, Sweden, assignors to Svenska Diamantbergborrningsaktiebolaget, Stockholm, Sweden, (U. S. No. 1,239,351; Sept. 4, 1917.)

Electrolytic Apparatus. Harry T. Shriver, West Orange, N. J. (U. S. No. 1,239,530; Sept. 11, 1917.)

Electrolytic Deposition. Apparatus for. Frank L. Antisell, Perth Amboy, N. J. (U. S. No. 1,239,443; Sept. 11, 1917.)

Feldspar—Process for Treating Feldspar, Feldspathic Rock, and Similar Material. Walter Glaeser, Brooklyn, N. Y., assignor to George T. Bishop, Macedonia, Ohio. (U. S. No. 1,239,787; Sept. 11, 1917.)

Ferrouranium Alloy. Robert M. Keeney and Louis F. Vogt, Washington, Penn., assignors to Standard Chemical Co., Pittsburgh, Penn. (U. S. Nos. 1,240,054 and 1,240,055; Sept. 11, 1917.)

Graphite—Method of Recovering Graphitic Carbon from Graphite Scale. Frederick W. Weissmann, Cincinnati, Ohio, assignor to The Hill & Griffith Co., Cincinnati, Ohio. (U. S. No. 1,239,992; Sept. 11, 1917.)

Lamp—Acetylene Miner's Lamp. Allen F. Adams, Madrid, Iowa. (U. S. No. 1,238,729; Sept. 4, 1917.)

Retort. Pierre Plantinga, Cleveland, Ohio. (U. S. No. 1,239,517; Sept. 11, 1917.)

Sintering—Machinery for Agglomerating Ore. Philip O. Harding, Rancagua, Chile. (U. S. No. 1,239,179; Sept. 4, 1917.)

Tamping Device. Vendel Sramcik, Senecaville, Ohio. (U. S. No. 1,239,631; Sept. 11, 1917.)

Editorial Correspondence

SAN FRANCISCO—Sept. 21

Snow in Siskiyou County for the first time this present season fell on Sept. 9. Mt. Shasta received a visible supply and a large amount of snow fell on the same day at and above an elevation of 11,000 ft. There has been a smaller amount of snow on Mt. Shasta during the past summer than for several years. It is estimated that about 10 in. was added during the recent snowfall.

Shasta County Copper Strike and strikers are being ignored and the mines are gradually resuming normal operations with miners willing to work under guarantee of protection from violence. The only way in which the companies could guarantee them protection was to employ armed guards which they did as soon as a sufficient number could be obtained. An effort was made by W. G. Mathewson, representative of the State Industrial Welfare Commission, to bring about some agreement between the mine managers and the strikers. The strikers said they would not return to work pending arbitration unless the guards were removed. Mr. Mathewson was asked if he would guarantee there would be no violence, in case the guards were removed. He replied in the negative. The strikers were asked if they would guarantee no further interruption of mine operation in case they were granted the $1 a day increase in wage. They replied that they would guarantee nothing; that if they wanted to strike five minutes after an agreement was made they would do so; they would do precisely as they pleased. There was other similar talk and, finally, at a consultation of Mr. Metcalfe, Mr. Anderson, Mr. Holman and Mr. Kett, representing the copper companies, it was agreed that they would resume work with as many men as possible and ignore the strikers completely. During the controversy between the strikers and the managers, Mr. Lubin, representing the State Housing and Immigration Commission, stated that under the recent act he had the power to call a public hearing when the whole question of wages and conditions affecting the industry can be gone into in detail. The final arrangement was to get the strikers together in mass meeting and explain to them that there is to be a public hearing and request them to return to work, pending a report of the investigation. The fact stands out plainly that if they return to work they will return upon the same terms which govern the men now working. A large number of men have quit work, some of them voluntarily and some of them through coercion on the part of the leaders. So long as enough miners are willing to work and to keep the mines open, there is no occasion for further discussion. The way the matter now stands there is nothing to arbitrate. Of course, the mines are not operating full handed, but they will be as soon as this band of agitators and disorganizers get tired of their jobs and move off to some other district to start new trouble. It is interesting to note that men who have returned to work are Americans. The strikers are chiefly foreigners. It is to the credit of some of them that they would willingly return to work if they were not afraid of violence at the hands of the men who have stirred up the trouble, in case they should be caught beyond the protection of the guards. So far as the Americans are concerned, they are capable of taking care of themselves when they are off shift.

BUTTE—Sept. 22

Anaconda is making another effort to operate its mines and smelteries without making a settlement with the striking miners and without recognizing them or dealing with them. The striking miners in Butte received important support, when the smeltermen at the Washoe smeltery at Anaconda joined in the strike and forced the closing of the company's mines in Butte, the smeltery in Great Falls, and other properties of the company in the state. This complete shutdown lasted about two weeks, and then the smeltermen decided to go back to work at the terms offered by the company, leaving the striking miners alone again. A majority of the miners also agreed to return to work but with all the company has less than 50% of its normal working force. This shortage, however, is largely due to the fact that thousands of miners have left the district, many going to other states and large numbers going east to engage in other labor. The back of the strike seems broken, but it will be many months before actual normal conditions are restored in the mines. The striking miners are holding out in their demands for a flat wage of $6 per day, regardless of the price of copper, and abolition of the "rustling card."

Raising the Cost of Living every time wages are increased is another great injustice under which the miners of Butte have suffered for years. Usually the increase is maintained thereafter, regardless of the fact that wages decrease again with the fall in the price of copper. Every time miners are granted an increase in wages, every restaurant, boarding-house keeper, lodging house, grocer, barber, laundry, and even saloons, advance their prices correspondingly, some going the raise in wages a little better. As soon as the companies announced, a few weeks ago, that an advance in miners' wages would be granted, every item that enters into the expense of living in Butte was advanced, and so the miners are always worse off than before, when they get an advance in wages based on a sliding scale and price of copper. For that reason, they are demanding a flat rate of pay. Should the price of copper drop to 15c. a lb. again, and miners have to accept $3.50 a day, they could not live in Butte, at present cost of living. Nearly every person responsible for the outrageous cost of everything in Butte is represented in the membership of the Employers' Association. The miners claim that the mining companies, if they had the interest of their employees at heart, could prevent this graft on the miners.

DENVER—Sept. 21

Colorado School of Mines receives an additional mill levy for maintenance, by an act of the last general assembly. The new act states that in addition to the levy now authorized by law, there shall be levied annually, beginning with the year 1917, upon all taxable property in the State of Colorado, for the use of the Colorado School of Mines, two-hundredths of one mill on each dollar of the assessed valuation of the taxable property.

State Mineral Department was authorized by act of the last general assembly. The State Board of Land Commissioners is directed to establish this department, to be under the direct supervision of the head of the department of mining in the Colorado School of Mines, who shall also be state mining engineer of Colorado. The board, with the advice of the state mining engineer, shall appoint an assistant state mining engineer. It shall be the duty of the state mining engineer to inspect in person, or through his assistant, all mines and other works operated under leases from the State of Colorado for the production of precious metals, coal, iron, oil, or other mineral products upon which rentals are due to the state, as often from time to time as he shall deem it necessary for the purpose of estimating and checking royalties therefrom, and keep such maps of the workings of all mines as will give the land department full information. Lessees of all lands, including coal lands, shall be required to furnish the state mining engineer with copies of blueprints of all maps of underground surveys of leased land made or authorized by the lessee, including engineer's field notes certified to by the engineer who made the survey. The state mining engineer shall supervise all mining and require the same to be done in accordance with the best methods of mining. Every mine and other works upon a public domain of the State of Colorado held under lease therefrom shall be at all times subject to the inspection of the state mining engineer.

SALT LAKE CITY—Sept. 22

Second Embargo on Ore Shipments—found necessary on the part of Salt Lake Valley smelters to relieve the congestion of ores—is being lifted in some cases and in others further extended. However, increasing shipments from the Tintic district—always a heavy sufferer in an embargo—are an indication that the situation is clearing somewhat. It is unfortunate that, with production at the present high rate, the situation should be further complicated by the difficulty of procuring adequate transportation.

Coal Supply of Salt Lake Valley remains a problem, as the Denver & Rio Grande railroad has found itself unable to meet the requirements of the coal mines of Carbon County. For one week the railroad was able to approach the number of cars promised—1800—but thereafter there was a falling off and in the week ended Sept. 8 only 1063 cars were available. Officials of the railroad in question lay the blame to the failure of connecting lines to supply an adequate number of return cars, and it is stated that weekly reports to the utilities commission by coal-carrying roads show more loaded cars received from the Denver & Rio Grande than empties returned. On the other hand, officials of connecting roads, refusing to assume the responsibility for the failure to return empty coal cars, allege Government demands upon transportation as being in the way of better service to Utah coal mines; and there the matter appears to rest at the present moment. In the meantime the coal mines are finding it practically impossible to operate at capacity, as well as difficult to keep their forces at normal, when not working full time.

WALLACE, IDAHO—Sept. 21

Mine Managers Conference was held and decision was unanimously reached to make no reply to the request of the miners' union made some time ago for a conference between the union officials and mine managers. This information was obtained from one who was present at the conference of managers. Labor conditions were regarded as satisfactory and there was no disposition to unionize the district, or even to recognize the union to the extent of making a formal reply to its request. One manager thought a reply should be made rejecting the invitation to confer, but he found no support in the meeting, and in fact was not disposed to press it himself. Decidedly the most interesting development in the conference of managers was the radical attitude of the Days in opposing any recognition whatever of the union. They were more vigorous in their opposition than any others, a position quite in contrast with that of former years when they were closely affiliated with the union during all the troublesome days, and their mine, the Hercules, was the haven of refuge for the old gang who found themselves shut out of other mines through the operation of the employment office. And this is not all. As a further safeguard against the encroachment of the union crowd, the Days are understood to have gone so far as to propose the restoration of the employment office. And Ed Boyce, founder of the Western Federation and for several terms its president, is a member of the Day family. Truly the world do move.

PHOENIX, ARIZ.—Sept. 20

Bureau of Mines Rescue Car No. 2 will be in attendance during the week of Nov. 7 at the State Fair. This car is fully equipped for mine rescue service and first-aid training and is in charge of C. A. Herbert. This will be an added attraction to the important mineral department. The new building for the mineral department is well under way, and it is hoped that it will be ready in time for the opening of the Fair.

Arizona State Bureau of Mines is planning to carry on extension work during the year. Charles F. Willis, director, is making a tour of the state to arrange for the work. It is intended that every member of the staff will be out on lecture work during some part of the year, the work being carried on continuously by one or another of the men. The state has been divided into three districts for the lecture courses. The southern and eastern districts will include Nogales, Patagonia, Tombstone, Bisbee, Douglas, Globe, Miami, Safford, Clifton, Morenci, Duncan and Wilcox. The western district includes Casa Grande, Ajo and Yuma. The northern district will take in Hayden, Ray, Phoenix, Wickenburg, Prescott, Mayer, Humboldt, Clarkdale, Jerome, Kingman, Oatman, Winslow, Flagstaff and Williams. The courses to be given in the places mentioned will cover three days. Safety Engineer S. C. Dickinson will give courses in first aid in towns, cities and the larger mining camps. The field

work of M. A. Allen, mineral technologist, will be to stimulate production of rare metals needed for war purposes and instruction in technology of the metals and minerals. G. R. Fansett, rock analyst, will instruct in mineral and rock identification. The lecture courses will be supplemented by demonstrations and illustrations. Moving-picture exhibitions will also be given. Members of the staff will talk before high schools, boy scouts, women's clubs or other organizations.

DULUTH, MINN.—Sept. 22

Iron Range Gardens were provided for at the beginning of the season when the Oliver Iron Mining Co. prepared the ground on large tracts on all of their locations and platted the same in small tracts, which were allotted by the "squatter" department to the employees free of charge. Large potato crops have been raised on these despite the fact that the season was so unfavorable. In order to take care of the product during the coming winter the company is building roothouses at central points.

Banner Season in Itasca County mining industry was shown when shipments for the year ended June 30, 1917, amounted to 5,684,556 tons as compared with 5,337,000 tons in 1916, and 5,464,000 tons for the year ended June 30, 1913. This year there were 19 properties shipping and the largest number in the former years was 13. During the last year 10,981,000 yd. of overburden was removed, which was the largest amount ever removed in one year before. Four new stripping projects were started: The Majorca, by Picands Mather Co., at Calumet; the Patrick and Ann properties by Butler Bros. at Nashwauk; and the York mine by A. B. Coates at Keewatin, all of which have been shipping ore this summer. The Bray and Pearson mines, which have been closed down the last few years, have been reopened. Three new washing plants have been built—the Patrick, which will treat the ores from the Patrick, Ann and Kevin mines; the Pearson for the Pearson mine; and the York at the York mine. In addition two concrete shafts were sunk, one at the Holman and one at the Hill mine of the Oliver company in the Canisteo district.

HOUGHTON, MICH.—Sept. 21

Copper Price of 23½c. per lb., fixed by the Government as the price for domestic consumers, for the Allies and for our own Government requirements, is looked upon here in the copper country as reasonably fair, but not to be compared with the Government price of $2.20 on wheat. The impression here was that 25c. would be a fair price, looking at the situation from a local labor standpoint as well as from the standpoint of the Government. But even at 23½c. a lb. it is not likely that there will be any of the mines shutting down. A few years ago any such price as 23c. for copper would have been considered as exceptionally advantageous to the copper-mining districts of the country. But the cost of production of copper has gone up in the last six or eight months to figures which seem all out of reason. The average cost of production here a few years ago was 12c., and this year the costs sheets of the mines of this district are running above 15c. at the best mines and above 20c. at the greater number of mines of the Michigan copper district. In fact, the average cost price of copper for the Lake Superior district this year will be greater than the average selling price of copper over any reasonably long period. "The best mine in this camp today is finding its mining costs alone to be over 10c." said one good authority yesterday. The increased cost of production largely goes to labor and labor is entitled to it, for the increased wages and the bonuses are needed to take care of the increased cost of living. However, the impression among the people of the Michigan district is that the Government price on copper is not unreasonable. It will mean an end to big profits for copper-mining companies, but it will provide for continuous operation of practically every mine here. It will mean that wages will at least be kept at their present figure. Further than that it will mean a reasonable profit for the shareholder. The greatest need of this district at present is more workingmen for the mines. The army has taken a large number of the best men, as copper mines did not ask for exemption for any of their employees.

JOPLIN, MO.—Sept. 22

Safety and Sanitation organization headquarters removal to a point west of Baxter Springs is being discussed by local operators, and is indicative of the waning importance of the Webb City-Carterville section of the field. The organization, which in reality is a mine operators' club, was formed about 2½ years ago, and has been the strongest organization of the sort the district has ever known. Of late attendance at the weekly Thursday meetings has been rather light, and it is believed removal to the Kansas-Oklahoma part of the field would mean renewed life and activity. There is talk of building a bungalow on the slope of what is known as the Blue Mound, a hill west of Baxter, and operating a buffet lunch for the operators at all times.

American Metal Co. has definitely entered this field by closing its option on a second lease of an 80-acre tract of the Ebbenstein land, immediately west of Baxter Springs, Kan. It has paid over $16,000 in cash, the last of the $35,000 bonus that was received by E. J. Pratt, George Moore and associates, of Webb City. First lease on the land is owned by Pratt and M. E. Grantham, of Baxter. Intensive drilling has been done on the tract for some time, and the American Metal Co. now has eight drills at work on one acre. Shaft sinking and full development, including mill building, is to be started at once. The principal orebody is found at 211 ft. and may mean heavy water. The decision of the company, after its careful investigation, has resulted in a new boom for the Baxter section of the field.

TORONTO—Sept. 22

High Price of Silver has occasioned renewed activity in prospecting in Portage Bay and Maple Mountain districts, and a number of good surface showings have been encountered. There are many promising prospects in these districts which have never been tested, and it is expected that under the stimulus of the present market conditions, the necessary capital for this purpose will shortly be forthcoming.

Cobalt Is Without Telephone Service, as are also the silver mines of the camp, because on Sept. 20 the wires were cut by order of the town council. The franchise of the company has expired and the company received three months' notice to cease doing business, as the municipality desires to construct its own telephone line. The courts issued an injunction prohibiting further interference with the equipment, and at last accounts the line was being repaired. The company offered to sell the system to the town but the price was considered too high. The case will shortly come before the court.

MELBOURNE—Aug. 5

Copper Producers' Association to be formed on the same lines as the Australian Zinc Producers' Association is being discussed. The object is to control the whole Australian output of copper, but seeing that copper does not represent the same proportion of the world's output as zinc it is difficult to understand what object is going to be attained, except that it will still further centralize the marketing of Australia's mineral production through one channel.

Tungsten and Molybdenum Ores have been advanced in price through agreement with the Imperial Munitions Department as a result of pressure from various quarters. Under the new scale, which is to operate as from July 1, 50s ($11.89 at present exchange) per unit will be paid for wolframite and scheelite of at least 65% trioxide, and 100s ($23.77) per unit for molybdenite of at least 85% molybdenum sulphide. The rates quoted are those being paid at the producing centers and compare with $10.74 and $21.59 under the old tariff. The rates at a port are higher in proportion.

The Mining News

ALASKA

MOTHER LODE COPPER MINES CO. (McCarthy)—Report for seven months ended Aug. 1 shows mine operated extracting shipping ore while sleigh road to railway at McCarthy remained good, except from Apr. 10, when 12-day labor strike occurred; also temporary shutdown on account of installing compressor chamber underground, 23 ft. from portal of Pittsburg tunnel. Additional 212 ft. of development since Jan. 1 making total of 8018 ft. Copper-silver ore reserves "in sight and estimated" amount to 113,930 tons. Commenced driving new tunnel to develop upper ore zone at estimated cost of $17.66 per ft., total length to be 830 ft. Two-compartment shaft sunk 51 ft. by hand drilling. Additional buildings and machinery, including tramway, being installed.

ARKANSAS

Marion County

E. O. OWENS, N. L. Wood and John Nanny, of Yellville, closed deal for new lead property 8 mi. north of Flippin. Ore high grade, no milling necessary.

GOODLUCK (Rush)—Development carried on at four different places. Good bodies of blende encountered. Contemplate constructing mill.

LOST JACK (Yellville)—Elmer Owens and N. L. Wood, sold lease on Lost Jack zinc mine to Liberty Lead and Zinc Co., which is erecting mill on Willet mine adjoining.

NORTH STAR (Yellville) — Shipped first car zinc ore this week. Mill operating.

ARIZONA

Cochise County

AT BISBEE, Sheriff Wheeler and deputies, assisted by citizens, arrested as vagrants returning I. W. W. men, upon arrival from detention camp, at Columbus, N. M. One hundred have been arrested so far.

CALUMET & ARIZONA (Warren)—Produced in August 4,296,000 lb. copper, compared with 3,551,205 lb. in July.

SHATTUCK-ARIZONA (Bisbee)—Having obtained satisfactory license from Minerals Separation for use of flotation process, will let contracts for erection of 400-ton mill to treat lead ores. Expect mill to be ready for operations by Mar. 1, 1918. Estimated to have 10-year supply of lead ore, over 1,000,000 tons being blocked on three sides. Labor conditions improved. Arthur Houle, superintendent.

Mohave County

BULLION HILL MINING CO. (Chloride)—Shaft down 280 ft.; crosscutting started at 300 ft.; should enter vein within 30 days. Jesse Knight, of Utah, principal owner. H. M. Eakin, superintendent.

NEW TENNESSEE MINING COMPANY (Chloride)—Drifting on 240-ft. level in gold-lead-zinc ore. Sinking soon to be resumed. G. J. Ridenour, superintendent.

DIANA (Chloride)—South crosscut on 200-ft. level entered vein 13 ft. from shaft, just entering oreshoot. Resembles high-grade silver-lead ore in upper workings. George F. Beveridge, superintendent.

Pinal County

GILA DEVELOPMENT (Kelvin)—Considering construction of a mill to be built early next year.

PINAL DEVELOPMENT (Kelvin)—Winze down 90 ft. and still in good ore. Shipments will be begun this month.

ARIZONA HERCULES (Kelvin)—Power-plant equipment beginning to arrive. The Ball mills and three Hardinge mills received. Erection of steel work on the mill proper begun.

Yavapai County

ARIZONA BINGHAMTON (Stoddard)—Treating 250 tons copper ore in flotation mill per day. Development work on 600-ft. level shows some ore. G. W. Johnson, general manager.

COPPER QUEEN (Stoddard)—Ore shipments to Arizona Binghamton mill discontinued. Two shafts unwatered. Will sink 300 ft. shaft at Adit No. 1, 200 ft. deeper. Claude Ferguson, superintendent.

CALUMET & JEROME (Jerome)—Total footage of 132 ft. is reported by G. W. Avery, general manager, as advance for last week in various headings on 600-ft. level. No. 1 drift being run southerly to cut under formation shown in tunnel above, now in 200 ft. Winze in No. 1-A discontinued on account of water. No work in No. 1-A. No. 2 has advanced 160 ft.; No. 2-R, new drift run southerly from No. 2-A, advanced 32 ft. to cut formation encountered in No. 2.

CALIFORNIA

Amador County

BRIDGE REPAIRS on Rancheria Creek, near Amador City, made by Fremont, Bunker Hill and other mines to prevent tailings from interfering with road traffic. Bridge raised and approaches filled in.

SOUTH KEYSTONE (Sutter Creek)—Since reopening through North Star shaft to depth of 1000 ft. north drift from crosscut, 300 ft. west of the 1000-ft. level, station has been cleaned out and extended to length of 813 ft.; crosscuts also being run at 800- and 600-ft. levels.

Butte County

HOLTON DREDGE NO. 4 (Oroville)—New ground dredged by American Gold Dredging Co. started in August. Probably last piece of virgin placer ground in this field.

Calaveras County

RAILROAD SURVEY nearing completion from Copperopolis to Valley Springs, connecting Calaveras Copper mines with Southern Pacific running to Sacramento. Projected road is 25 mi. long, or 8 mi. longer than that to Milton, but more direct to Sacramento.

CALAVERAS (Murphys)—Unwatering started by Latchford & Dumstead, of Los Angeles. Pumps operated by electric power from Utica Mining Co. plant. Producer in past.

Eldorado County

CHROME DEPOSIT on Williamson ranch, near Webber Creek bridge, yielded a carload in one week with two men working. Estimated 18 to 20 carloads still to be extracted.

Kern County

BALTIC (Johannesburg)—Leased to Robert Nicoll to develop tungsten and gold. Good gold producer a few years ago but litigation and insufficient capital closed it down.

Mono County

NEW MINING DISTRICT, near Queen, being prospected on edge of California-Nevada state line, about 10 mi. north of Benton. Samples at Bishop show silver contents.

Nevada County

SUMMIT (Grass Valley)—Recently optioned along with Mohegan and New England, by J. H. Batcher, of San Francisco. Sampling and tests by J. C. Campbell, of Nevada City, satisfactory and three properties will be jointly operated. New hoisting plant on New England contemplated for old deep shaft and provide means of developing all three properties. Each was producer in past.

GRASS VALLEY CONSOLIDATED (Grass Valley)—Charles A. Brockington resigned as manager of Allison Ranch mine, succeeded by Robert Hathaway. Brockington will resume development of Golden Center mine. He reopened both these properties and installed Allison Ranch mill and cyanide plant. Golden Center incline shaft will be deepened.

Plumas County

DROGE (Greenville)—Reported property optioned by Eastern men; John W. Dailey, in charge of development.

PHILADELPHIA EXPLORATION CO. (San Francisco)—Developing Crescent and Green Mountain gold properties at Crescent Mills. Albert Burch, manager.

QUIGLEY (Laporte)—Reported that gravel property purchased by J. T. Buell, of Marin County, and electric power plant will be installed on south fork of Feather River, along with modern machinery at mine.

Trinity County

SCOTT MOUNTAIN ROAD from Siskiyou into Trinity County is to be built by popular subscription and board of supervisors. Will open up a large amount of mining and agricultural land that has been generally inaccessible. The Trinity end of the road will extend from the Siskiyou County line to Weaverville.

COLORADO

Lake County

GRAY EAGLE (Leadville)—Work resumed in shaft below 500-ft. level; development work to be continued on bottom level. Arranging to handle output on surface from stopes opened on 500-ft. level.

Park County

COMMONWEALTH (Alma)—Operating Magnolia mine and Eddy mill, has completed installation of cyanide process and operating tramway.

LONDON (Alma)—Crosscut tunnel, now in 400 ft., being driven to 1200 ft. to cut vein at depth. New boarding house being built at mine, and mill and cyanide plant will be built at tunnel portal. C. P. Aicher, manager.

San Juan County

SHIPMENTS FROM SILVERTON of concentrates and crude ore during August were: To outside smelteries, 200 carloads; to Silver Lake custom mill, 98 carloads; to North Star custom mill, 37 carloads.

COMING WONDER (Silverton)—Ore developed during past few months. Wire-rope tramway erected.

HIGHLAND MARY (Silverton)—Three shifts employed at property, situated at head of Cunningham Gulch. Mill operating; shipping. J. H. Slattery, manager.

San Miguel County

SHIPMENTS FROM TELLURIDE of ore and concentrates during August were: Tomboy, six cars concentrates to Durango and 41 to Blende; Smuggler-Union and Black Bear, eight cars to Durango and 53 to Blende; Liberty Bell, 12 cars to Durango; Carruthers Lease, two cars to Durango; Modena Mining Co., one car crude ore to Durango; total, 123 cars. During August, 1916, 117 cars were shipped.

BLACK BEAR (Telluride)—New compressor installed.

LIBERTY BELL (Telluride)—Two 3-ton electric locomotives for Stillwell tunnel transported to mine in wagons, each with six horses pulling and four pushing behind, hitched to large pole.

SMUGGLER-UNION (Telluride)—One-bucket aërial tramway, 2000 ft. in length, to Bridal Veil Falls power plant, completed. Tramway will be used for sending down timber, and transporting men and supplies to and from power plant. Tramway crosses dangerous snow-slide area. New barge and larger pump installed on Blue Lake, source of company's two hydro-electrical power plants.

Summit County

FARNCOMB HILL DREDGING CO. (Breckenridge)—First dividend of 4% on capital stock of $300,000 declared. Ground belonging to company being worked by two dredges of Tonopah Placers Co. under lease. All expenses of company have been paid, so that practically all future earnings can be paid out in dividends.

Teller County

LAST DOLLAR (Cripple Creek)—New fireproof buildings being erected by Catherine Gold Mining Co. will be ready for machinery and other equipment within 10 days.

CRESSON (Cripple Creek)—Ore developed on 14th level, 30 ft. high at west end, 15 ft. at east end of main stope. Drift on 15th level recently opened orebody 15 ft. long. Attempts made to find downward continuation of oreshoot on 14th level by inclined diamond-drill holes, but unsuccessful.

IDAHO

Shoshone County

INTERSTATE-CALLAHAN (Wallace)—Official statement for August gives total amount of ore mined and milled as 15,005 tons, averaging 21.5% zinc, 7.2% lead and 3 oz. silver per ton. Crude ore and concentrates shipped amounted to 5226 tons of zinc and 951 tons of lead. Assay of shipments showed about 47% zinc, 46% lead and 18 oz. silver. Flotation plant practically completed. August shipments were above average for last quarter.

Fremont County

WILBERT (Arco)—Situated 40 mi. from Arco. Ore found in disseminations and stringers in fracture planes of overturned fold in quartzite. Ore shipped from 800-ft. depth is about 50% lead and has high silver contents. During year ended May 15, mined 7337 tons at cost of $5.70 per ton. Net profit for year was $19,578. Wilbert Annex, adjoining, being developed on strength of results obtained in Wilbert. Machinery shipped includes compressor, drills, cars, etc.; foundations already installed for compressor. A. S. Ross, president of both companies and D. J. Lemmon, superintendent. General offices, 221 Kearns Bldg., Salt Lake City, Utah.

KANSAS

Montgomery County

AMERICAN ZINC, LEAD AND SMELTING (Caney)—Plant here and at Dearing closed down for some time, partially on account of high cost of operations, permitting no profit at 8c. for prime western spelter, to smelteries which buy ore or concentrates, and also because American Metal Co. is treating all of Butte & Superior product, about half of which went to these smelteries previously, permitting a large profit on high-priced spelter.

MICHIGAN

Copper

BEAR LAKE "POOL" (Calumet)—Diamond drill down 300 ft. in decomposed conglomerate.

MOHAWK (Mohawk) — Four heads of this and two of the Wolverine mill working to capacity. New Hardinge mill ready for installation.

ISLE ROYALE (Houghton)—Trace of gold recently found in rock, associated with silver which is becoming an important item in this mine's production.

CHEROKEE (Houghton) — Shaft down 450 ft. and openings latterly at each level extend 300 ft., showing fair amount of copper. Will need no additional financing until next summer. Exploration work still being done.

CALUMET & HECLA (Calumet)—Production in August by C. & H. and subsidiaries was: C. & H., 6,336,986 lb.; Ahmeek, 2,329,000; Allouez, 651,499; Centennial, 196,192; Isle Royale, 1,061,547; La Salle, 159,586; Osceola, 1,119,538; Superior, 183,320; White Pine, 301,037 lb.

LAKE MILLING, SMELTING AND REFINING CO. (Point Mills)—Stamp mill, owned and operated for Calumet & Hecla subsidiaries and Hancock Consolidated, will, by next summer, have larger capacity than any other in Lake Superior district. Has six heads working and is installing two additional stamp heads. Handles rock from Allouez, its largest producer, Centennial, Isle Royale, La Salle, Hancock and other custom ore.

MINNESOTA

Mesabi Range

E. J. LONGYEAR CO. (Hibbing)—Building brick sample warehouse to replace one sold to State for chemical laboratory.

SOUTH UNO (Hibbing)—M. A. Hanna Co. making plans to strip small tract on north side of pit amounting to about 85,000 cu.yd. this winter.

OLIVER IRON MINING (Chisholm)—Nine drills at work on Clark Iron Co. property which lays just south of Hartly mine in N.E. ¼ Sect. 23-58-20.

LINCOLN (Virginia)—Owned by Interstate Iron Co. Fire in main shaft closed mine last week. Quick response of Helmet Men of Oliver Iron Mining Co. Safety Department prevented spreading.

WEBB (Hibbing)—Owned by Shenango Furnace Co., E. J. Maney, general manager, and has just paid off a $2,500,000 mortgage against this mine, making it free from incumbrance. Pittsburgh Trust Co. of Pittsburgh was holder of mortgage to run for 50 years. Shenango Furnace Co. operated mine and paid the Trust company a royalty of 25c. a ton mined. Royalties have satisfied mortgage.

MISSOURI

Christian County

SQUARE DEAL MINING AND ROYALTY CO. (Ozark)—Situated in Elk Valley district, two miles southeast of Ozark. Has lease on C. Y. Bain land. Shaft sunk, striking lead and zinc ore at 25 ft. depth, continuing to bottom at 51 feet. Development work will be done and if showings warrant, mill will be constructed. Office, 938 Landers Building, Springfield, Mo. F. S. Dodge, president.

Joplin District

EAGLE-PICHER (Joplin)—Completed installing district's largest compressor, 4000 ft. per min., at central power plant at Picher, Okla. Weighs 145 tons, set on 13-ft. concrete foundation.

U. S. SMELTING (Picher, Okla.)—Working on big modern mill west of Blue Mound plant in Kansas. Will use ball mill and oil-flotation plant; 600-ton capacity in 24 hours.

REBEKAH (Picher, Okla.)—Shaft sinking and mill building being pushed on tract west of U. S. Smelting Co.'s new plant; 252 acres in lease. W. A. Woods, superintendent and part owner.

ETHEL GRAY (Joplin)—Completed new shaft to west of mill and is building tram and hopper. Drilling to east of mill re-

sulted in rich drill hole, which will be reached by drifting from present workings.

IMPERIAL DEVELOPMENT CO. (Miami, Okla.)—Has three Pomona pumps operating in one shaft on lease east of Douthat, Okla. Total capacity, 2540 gal. per min. Pump shafts go down corners of shaft and still a fourth pump could be used, though shaft is only 5x7 in clear.

HOMESTAKE (Quapaw, Okla.)—New 250-ton mill completed; ground not yet well opened. Turner Mining Co., a subsidiary, started erection of mill on lease adjoining on north, and some investors will build third mill on east part of 60-acre lease. T. P. Turner, manager. R. M. Scott, treasurer.

MONTANA

Fergus County

BARNES KING DEVELOPMENT (Kendall)—August report shows that at North Mocasin, treated 2239 tons, bullion production was $22,800. Gloster and Shannon produced 4586 tons, yielding $103,000 in bullion. Ore from Shannon averaged $27.38 per ton and came from high-grade streak on 500-ft. level. Balance due for Shannon mine, amounting to $44,940 will be paid immediately.

Silver Bow County

DAVIS-DALY COPPER CO. (Butte)—Gross receipts during quarter ended June 30 were $237,244 and expenses $161,512, leaving net profits of $75,732. Treasury balance, June 30, was $160,000. Shipments aggregated 12,326 tons, producing 1,158,356 lb., copper and 71,535 oz., silver. Hibernia mine has new headframe erected and mine equipped with machinery. Exploiting manganese ores outcropping on Hibernia. Estimated manganese orebody contains between 400,000 and 700,000 tons of 43% to 47% manganese. Concentration in Ophir mill of Butte-Detroit company being tested successfully. At company's Great Republic mine, about 1000 ft. beyond Hibernia mine, another manganese body being opened.

NEVADA

Lander County

GEORGE RUSSELL, of Elko, recently discovered tin ore on his cattle ranch in unnamed range of hills, 20 mi. north of Battle Mountain. Nugget was found in April, 1914, and sent to University of California, where it was reported to be high-grade tin ore. Subsequently discovered in several localities by Edward Larson. Small amount of development work done at different points. Ore 4 to 5 ft. wide found at depth of 50 ft. in one place. Lack of capital retards development.

Mineral County

CALAVADA COPPER (Luning)—Group of claims in Santa Fe district under development for last three years, has been shipping to International Smelting Co., at Tooele, Utah; proceeds put back into development.

Nye County

TONOPAH ORE PRODUCTION for week ended Sept. 15 was 9521 tons valued at $166.617, comparing with 8356 tons the previous week. Producers were: Tonopah Belmont, 2692 tons; Tonopah Mining, 2200 tons; Tonopah Extension, 2380 tons; Jim Butler, 900 tons; West End, 854 tons; Montana, 327 tons; Rescue, 128 tons; Cash Boy, 40 tons.

UNION AMALGAMATED (Manhattan)—East drift on 600-ft. level cut one of three orebodies developed in Earl claim above 350-ft. level. Heavy flow of water encountered, increasing after vein uncovered. Expect to cut Swanson orebody in short distance.

MANHATTAN CONSOLIDATED MINES DEVELOPMENT (Manhattan)—Working shaft down 80 ft. below 300-ft. level and timbered to point 66 ft. below. In hard limestone and making little water.

OREGON

Josephine County

CHROME ORE is now being shipped from the Gravlin property at Cold Spring. M. A. Delano, of Grant's Pass, in charge.

BRITTEN & WILSON (Waldo)—Rich vein of copper ore being crosscut at this mine on Patricks creek. J. N. Britten, manager.

MONUMENTAL (Waldo) — This gold mine, idle for several years, may be operated by eastern company. E. A. McPherson, in charge.

CHROME AND MANGANESE deposits are being developed on Gray Back Mountain by R. C. Fehely and R. W. Kitterman, of Kerby, and others.

GRIFFIN CINNABAR (Waldo)—Being examined by J. C. Kendare and Earnest Rackliff of Nevada. It is adjacent to the Ehrman, Cole & Taggert property. John Griffin, Kerby, manager.

CHROME (Selma)—Five trucks hauling from this chrome mine down the Illinois River to Waters Creek. More will be put on when available. Shipping 50 tons daily to Niagara Falls, N. Y. Employing 18 men. R. J. Rowen, manager.

SOUTH DAKOTA

Lawrence County

TROJAN (Deadwood)—Shipments of ore from Republic mine, which is under lease to company, being made to mill at Trojan.

CUSTER PEAKE (Roubaix)—Concentrator consisting of 10 stamps, Hartz jig, ball mill and four Wilfley tables placed in commission. Ore on 300-ft. level shows about 2% native copper and $3 per ton in gold.

HOMESTAKE (Lead)—Grade for water ditch between Savoy and Maurice nearly completed and laying of wood-stave pipe started. Expected work will be completed by Dec. 1 with exception of power plant below Maurice. Upon completion of new electric plant, works will be electrified, with exception of hoists.

UTAH

Beaver County

KING DAVID (Frisco)—Development to be resumed on 800- and 200-ft. levels. Adjoins Horn Silver on west. Jesse Knight, of Provo, interested.

MOSCOW (Milford) — Ore opened in southern end on 1400-ft. level, continuing upward and downward. The 500-ft. level being developed toward south, stringer of good ore followed. Boston claim, leased for year, marketed one car and another is ready. Ore opened in Commonwealth being developed by G. Wilkin, superintendent of Moscow, in three places. Property lies 700 ft. south of Moscow.

Juab County

CHIEF CONSOLIDATED (Eureka)—Old Tetro shaft, 4000 ft. west of main shaft, to be enlarged and sunk further. Present depth, 400 ft.

TINTIC MILLING (Silver City) — Expect $25,000 for precipitates shipped recently; car of bullion ready for market valued at $35,000. Treating 225 to 250 tons daily.

Salt Lake County

UTAH APEX (Bingham)—Estimated to be 50,000 tons of ore in one block of ground, carrying 14% lead and 14% zinc.

COLUMBUS REXALL (Salt Lake) — Production since strike, 10 or 11 weeks ago, estimated at 900 tons.

CENTRAL UTAH OIL SHALE (Salt Lake) — Company capitalized at 100,000 shares, par value $100 each, organized in Salt Lake City. Directors: Judge Le Grande Young, of Salt Lake; S. P. Critchlow, of Ogden and others. Owns about 4000 acres of oil-bearing shale in Sanpete field in central Utah.

Summit County

PARK CITY SHIPMENTS for week ended Sept. 15 were 5,172,930 lb.

NEW QUINCY (Park City)—Car of 47 tons, dry weight, shipped recently.

PARK CITY KING (Park City)—Camp to be built for winter work on Big Cottonwood side near head of Thaynes Cañon. Tunnel in 160 ft., and contract let for another 300 ft. Expect to cut first of three fissures in about 75 feet.

SILVER KING COALITION (Park City)—Shipping 600 tons weekly of crude ore and concentrates. Seeking injunction to prevent Judge Mining & Smelting, Keystone Mining, and Conkling Mining from completing tunnel connecting properties, claiming it drains Alliance tunnel of Silver King, depriving company and town of Park City of water supply.

Tooele County

DEEP CREEK COPPER KING (Gold Hill)—To resume work on Moonlight group extending southerly from Western Utah Copper. Shaft down 32 ft., to be sunk 100 ft. further to follow vein, carrying lead, silver, copper and some gold. Also tungsten. Owns 10 claims. R. C. Naylor, county treasurer, is president, and John Pingree, of Merchants' Bank, vice president.

WASHINGTON

Stevens County

NORTHWEST MAGNESITE CO. (Chewelah)—Shipped 35,000 tons crude magnesite since December, 1916, all calcined in East. Calcining plant now under construction to reduce bulk of shipments and facilitate marketing. One unit, of two rotary kilns, 7½ x 125 ft., completed with capacity of 200 tons per day, reducing bulk 45%. Large motors being installed for power; also coal-pulverizing plant for fuel instead of crude oil, now in use. Up to present, ore hauled from quarries by teams and motor trucks, costing $2 per ton, to be replaced by cable tramway now under construction.

CANADA

British Columbia

CANADA COPPER CORPORATION, LTD. (Greenwood)—Production for August was 212,772 lb. fine copper. Smeltery shut down from June 26 to Aug. 15, owing to coke shortage.

Ontario

FIDELITY MINING CO. (Kirkland Lake)—On one claim 5-ft. vein discovered.

NATIONAL (Cobalt)—Treating 100 tons a day of old tailings by flotation.

McKINLEY-DARRAGH (Cobalt) — In August treated 7500 tons, which is a record.

ELDORADO (Porcupine)—Arrangements made to diamond drill property.

MAIDENS MACDONALD (Porcupine)—Formerly under option to La Rose has now been purchased by Coniagas.

BILSKY (Porcupine)—This claim worked under option by the Apex; drill cut a 15-ft. vein at the 700-ft. level, showing free gold.

GENESSEE (Cobalt) — Main shaft is down 572 ft. Station has been cut at 550 ft. level; driving toward Chambers-Ferland ground.

McINTYRE (Schumacher) — Production during August, $141,394; tonnage treated was 15,410, forming a new high record. Average value, $9.52 per ton.

MINAKER KIRKLAND (Kirkland Lake)—Test pits having been sunk with encouraging results, a mining plant sufficient to develop the property to the 200-ft. level will shortly be installed.

KERR LAKE (Cobalt)—Produced 200,855 oz. silver in August. Production for 12 mo., 2,595,632 oz. Fleming vein, in conglomerate just above the Keewatin contact, shows richness.

HOLLINGER (Timmins)—Developments satisfactory and may resume dividends. Ore reserves largely added to. Some new veins found on upper levels and some known veins cut on 800 and 1200-ft. levels. Employing 1100 men.

NEWRAY (Porcupine)—Being examined by engineers of U. S. Smelting, Refining and Mining Co. who have 60-day option. If accepted will increase capital to $3,000,000, and option taken on 2,000,000 shares at 50c. a share.

NIPISSING (Cobalt)—In August mined ore of estimated value of $293,116 and shipped bullion from Nipissing and customs ore of estimated net value of $588,254. Low-grade mill treated 6395 tons and high-grade mill treated 32 tons and shipped 640,092 oz. of silver.

BRITISH AMERICA NICKEL CORPORATION (Toronto)—Power question not yet settled. Diamond drilling has disclosed additional ore at Murray mine in Sudbury district, according to E. P. Mathewson, general manager. Christiania (Norway) office of company received telegram from representative of British Government, on board of directors, stating that discovery shows copper-nickel ore, 80 ft. thick, and will add 5,000,000 tons to the 11,000,000 tons of reserves already blocked out.

MEXICO

OPERATION OF MINES is reported to be under consideration again by some of the American companies. Conditions show improvement, but in the case of most of the companies nothing has been definitely decided. They are awaiting information from their managers in El Paso and at the properties. Several weeks will probably elapse before any actual steps toward resumption are taken. According to a Nogales report the "Cámara de los Obreros," the labor council of Sonora, that has proved so troublesome to American mining companies operating in the State, has been abolished by an order of Acting Governor C. G. Soriano. It is replaced by a "committee on conciliation and arbitration" with only a tithe of the power assumed by the former body, which had promulgated general and special regulations onerous to employers, and even laid fines on corporations that were considered in error in their dealings with the workingman.

AUSTRALIA

MINERAL PRODUCTION of West Australia during 1916 was valued at £4,893,417; gold yield was 1,061,398 oz., valued at £4,508,532 ($21,415,527); coal production amounted to 301,526 tons valued at £147,823 ($702,159); balance made up of lead, silver, copper and tin.

The Market Report

Metal Markets

SILVER AND STERLING EXCHANGE

Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Sept.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
20	4.7550	106½	54	24	4.7550	108½	55
21	4.7550	108½	55	25	4.7550	108½	55
22	4.7550	108½	55	26	4.7550	106½	54

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
			7⅞	7.75	8.00
20	*26	61¼	@8	@7.90	@8.15
			7⅞	7.75	8.00
21	23½	61⅜	@8	@7.90	@8.15
			7⅞	7.75	8.00
22	23½	61¼	@8	@7.90	@8.15
			7⅞	7.75	8⅛
24	23½	62	@8	@7.90	@8⅛
				7.80	8⅛
25	23½	62	8	@7.90	@8⅛
				7.80	8⅛
26	23½	62	8	@7.90	@8⅛

* Nominal.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes; ingots and wirebars. Beginning with Sept. 21, we quote the price fixed by the U. S. Government.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 6.3c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Sept.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
20	120	119½	137	243	240½	30½	54
21	120	119½	137	244½	242	30½	54
22							
24	110	110	130	247½	244½	30½	54
25	110	110	130	247	243	30½	54
26	110	110	130	245½	242½	30½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.75½. £30½ = 6.474c.; £54 = 11.462c.; £120 = 25.473c.; £137 = 29.082c.; £240 = 50.946c. Variations, £1 = 0.212277c.

NEW YORK—Sept. 26

The all-absorbing topic this week has been the fixing of the prices for copper, iron ore, pig iron and steel products. The prices were generally satisfactory, but the quotations were a surprise, and have dazed the market in a way from which it has not yet recovered so as to see clearly.

Copper—On Thursday, Sept. 20, the market was in suspense, news from Washington being expected hourly, and no business was done, wherefore our quotation for that day is nominal. On Sept. 21 came the news of the fixing of the price of 23½c., f.o.b. New York, to take effect immediately. We have adopted the Government price for our daily quotation, beginning with Sept. 21 and hereafter until further notice. The subject is discussed fully elsewhere in this issue.

During this week, no business was done by producers. Consumers were anxious to obtain copper, but reported to us that they could not get anything from producers, though small supplies were offered to them by brokers at prices considerably higher than the Government price.

It is the opinion among producers that after the Government requirements are filled, and the orders of the Allies, there will remain for domestic consumers only a small part of what they will want. It is expected that there will be a priority board, comprising representatives of the Army and Navy Departments, together with the principal producers, that will sit in New York and determine how copper will be shipped and to whom.

At a meeting of the copper sales managers at India House on Sept. 25, the matter of introducing trade acceptances was discussed as a substitute for the present practice of selling to domestic consumers on terms of "delivered, 30 days" and waiting for the money. Leopold Fredrick, of the American Smelting and Refining Co., pointed out that the adoption of trade acceptances in the metal business would add many millions of dollars of trade acceptances to the circulation.

Copper Sheets are quoted at 35c. per lb. for hot rolled, and 1c. higher for cold rolled. Wire is quoted nominally at 31c. per lb., f.o.b. mill.

Tin—The market was very narrow and the business that was done was mostly in driblets. The total of transactions in spot tin was probably not over 300 tons, of spot and futures, together perhaps about 600 tons. At the close Straits tin was quoted at 62c. and Banka at 60c.

Lead—The last price named by the American Smelting and Refining Co. was 8c., New York, and was immediately shaded by other sellers, and this continued in the early days of this week, but inquiries swelled in volume as the week progressed, with the result that a rather large volume of business was done and a large part of it was at the full price of 8c. There were some large domestic inquiries in the market, but the bulk of the domestic business was represented by small lots, and prompt delivery generally was wanted. A considerable export business was done, there being sales both to Europe and South America. There are still sellers of lead for future delivery—October—November—at concessions below the present market. However, the fact that important business developed around 8c. lends color to the belief that the decline in lead has bottomed.

Zinc—The market was a shade stronger, but the volume of business continued to be small.

On Sept. 24, it was reported from Washington that a contract for 1000 tons of Grade B spelter had been awarded to the American Metal Co. at 10.67c. per lb. The respective bids were interesting, being as follows: American Zinc, Lead and Smelting Co., Eastern Zinc Refining Co., General Smelting Co., Kusa Spelter Co., Matthiessen & Hegeler Zinc Co., United Zinc Smelting Co. and United States Smelting Co., each offered to supply at 12c.; American Smelting and Refining Co., at 11.875; L. Vogelstein & Co. at 11.45, and Illinois Smelting and Refining Co. at 11.45c.; Trenton Smelting and Refining Co. at 11.3c.; Great Western Smelting and Refining Co. at 11.2c.; Beer, Sondheimer & Co. at 11c., and American Metal Co. at 10.67 cents.

Zinc Sheets—Price of zinc sheets has not been changed. Market is still at $19 per 100 lb. f.o.b. Peru, Ill., less 8% discount.

Aluminum — This metal was slightly stronger. Quotations are still made at 42@43c. per lb. for small lots of No. 1 ingots, New York, but some dealers are holding for a higher price as miscellaneous stocks are light and inquiries are more numerous.

Antimony—The market was reported a little stronger, but producers are still holding aloof. We quote 15¼@15½c. for spot and 15¼@15½c. for futures, c.i.f., in bond.

Bismuth—Unchanged at $3.50 per pound.

Cadmium—This metal is quoted at $1.40@1.50 per pound.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—The market was apparently steady at $110 but the quotation is more nominal than representative of actual business, and there were intimations that business might be done at concessions. San Francisco reports, by telegraph, $110, market steady.

Gold, Silver and Platinum

Silver—Market reached the highest figure attained in the present rise, namely, 55d. in London and $1.08½ per oz. in New York, but owing to lack of Eastern orders at the advance, some reaction has set in and business closes quiet with limited transactions.

Mexican dollars at New York: Sept. 19, 85c.; 20, 86c.; 21, 87c.; 22, 87c.; 24, 87c.; 25, 87c.

Platinum —Steady at $103@105, with good business reported.

Palladium — We quote $120@125 and considerable activity.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 22—Blende per ton, high, $77.80; basis 60% Zn, premium $75; medium to low, $65; calamine, per ton 40% Zn, $35@30; average selling price, all grades zinc, $64.63 per ton.

Lead, high, $83; basis 80% Pb, declined from $90 to $75.

Shipments the week: Blende, 8762 tons; calamine, 452 tons; lead, 765 tons. Value, all ores, the week, $668,590.

Not a carload lot of lead concentrate was purchased this week, and the bulk of this mineral shipped was purchased on last week's price quotation. Buyers are taking from one-third to one-fourth less zinc ore than their midsummer average shipments. With some accumulated stocks buyers have been enabled to crowd medium grades to the level of low, with only $60 bid today for low on next week's price making.

Platteville, Wis., Sept. 22—Blende, basis 60% Zn, $70 base for premium grade, down to $65 base for medium grade. Lead ore, basis 80% Pb, $80 per ton. Shipments reported for the week are 2903 tons of zinc ore, 35 tons of lead ore, and 424 tons of sulphur ore. For the year to date the figures are: 104,250 tons of zinc ore, 5016 tons of lead ore, and 20,440 tons of sulphur ore. Shipped during week to separating plants, 3891 tons of zinc ore.

Other Ores

Chrome Ore—Firm at 90c. per unit per net ton f.o.b. California, minimum 48% chromic oxide.

Manganese Ore—Unchanged at $1 per unit on the basis of 48% manganese.

Molybdenum Ore — Unchanged at $2.20 per lb. on the basis of 90% molybdenum sulphide.

Pyrites—Spanish lump quoted at 15½c. per unit on basis of 10s. ocean freight, buyer to pay war risk, excess freight and any duty. Ocean freights are 35s. for northern ports, 40s. for south Atlantic and 42s. 6d. for Gulf ports.

Tungsten Ore—A large business was done at unchanged prices, except that off-grade ores were salable more advantageously than a little while ago. We quote scheelite at $26 and high-grade wolframite (65%) at $23@25, while lower-grade ore (60%) might be quoted at $20@22.

Iron Trade Review

NEW YORK—Sept. 26

Since the announcement on Monday of the prices agreed upon by the Government and leading steel producers the trade has been in utter confusion, says "Iron Age." Surprise that the prices were agreed upon rather than imposed by the Government was followed by excited efforts to get details which thus far are lacking, and meanwhile business practically stopped.

PITTSBURGH—Sept. 25

The whole steel-producing trade, with perhaps an exception here and there, is pleased that the long uncertainty as to prices has at last been ended, and by an arrangement that is regarded as equitable to all concerned. A meeting at which nearly all the steel production was represented was held at Washington, last Friday, and the manufacturers prepared a schedule of prices as follows: Iron ore, same as for the present season; pig iron, $33; bars, 2.90c.; shapes, 3c.; plates, 3.25c. This was given to the War Industries Board, which submitted it to President Wilson, who approved it Saturday afternoon and the formal announcement was made by the Committee on Public Information yesterday afternoon. The ore prices are based on $5.05 for Mesabi nonbessemer at Lake Erie dock. The $33 pig iron is basic, foundry and malleable at valley furnaces, other grades, and iron in other districts, to be worked out by a committee of the American Iron and Steel Institute and then submitted to Washington for approval. Prices for billets, sheet bars, sheets, pipe, wire, etc., are to be worked out in proper relation to the prices that have been fixed. All this will be relatively easy, now that a general price level has been set, for bars, shapes and plates constitute about one-half the total steel output.

The market will not at once become active as a result of this agreement, for there was no buying pressure. The mills are well sold and consumers are equally well covered. Mills will doubtless limit their sales until they have disposed of much of the tonnage now on the books. Not a great deal of this is at prices materially higher than those now fixed, as there is much old business and it was only in recent months that prices advanced to such extremely high points. Bars at 2.90c., shapes at 3c. and plates at 3.25c. will average about 3.10c., having regard to the respective tonnages and at the low point nearly three years ago they stood at 1.05c. as an open market quotation, while some sales were made at less, so that the new prices are approximately triple the lowest. In previous price advances these products did well to advance 40 to 60 per cent.

Pig Iron—To set a precedent, this morning, 1000 tons of basic iron was sold at the fixed price of $33, in return for 1000 tons of bessemer at the tentative price of $33.60, this being 10% higher, as the average spread of bessemer above basic has been about 10% in the past. Business in basic, foundry and malleable is permissible, the price being fixed at $33, valley, but the market has been stagnant and will likely remain so. Some consumers are caught with contracts at higher than $33, but some are always caught in a market decline, though not on as large a tonnage as this time. In other districts trading at precise prices will have to await the approval of a schedule fixing differentials between districts, in harmony with $33, valley.

Steel—It is probable that prices for billets and sheet bars will be submitted by a committee of the American Iron and Steel Institute for approval by the War Industries Board. The billet price will perhaps be on the familiar trade basis of 50% over pig iron, or say $50. Hitherto the spread of sheet bars above billets has not exceeded $1, except lately.

Ferroalloys

Ferromanganese—The market has continued very quiet, with prompt at not over $375 and fourth quarter at $350. It is possible the price will be regulated by agreement. Consumers clearly are indisposed to take hold at anything like present prices.

Coke

Connellsville—Selling of coke is illegal at above $6. Sales of a few spot carloads were made today at this figure, some of it being coke that was offered yesterday at $12.50 without finding takers. The differential for foundry coke is still to be worked out. In the last week there has been additional contracting for furnace coke for 1918 delivery, and on this movement between one-half and two-thirds of the merchant output of the region has been sold under contract, possibly more. The bulk of the business was done at flat prices, chiefly $8, $8.25 and $8.50, though a little went at under $8 and a little at $9, price depending largely on grade. Some business was done on a sliding-scale basis, 4½ or 5 tons of coke against one ton of basic iron, valley. The buying, at prices higher than expected to be fixed by the Government, was done in the expectation that good deliveries would be received when the open market was limited to a lower figure.

STOCK QUOTATIONS

N. Y. EXCH.†	Sept. 25
Alaska Gold M.	4½
Alaska Juneau	3
Am.Sm.& Ref.,com.	101
Am. Sm. & Ref., pf.	107½
Am. Sm. Sec., pf., A	95
Am. Sm. Sec., pf. B.	‡93
Am. Zinc	18½
Am. Zinc, pf.	54
Anaconda	73
Batopilas Min.	1½
Bethlehem Steel	96½
Bethlehem Steel, pf.	91
Butte & Superior	25½
Cerro de Pasco	32½
Chile Cop.	19
Chino	52¾
Colo.Fuel & Iron	46½
Crucible Steel	74
Dome Mines	9½
Federal M. & S.	23
Federal M. & S., pf.	45½
Great Nor., ore ctf.	35½
Greene Cananea	43½
Gulf States Steel	103
Homestake	102
Inspiration Con.	51½
International Nickel	34¾
Kennecott	41½
Lackawanna Steel	85½
Miami Copper	35
Nat'l Lead, com.	52
National Lead, pf.	104
Nev. Consol.	21¾
Ontario Min.	6½
Quicksilver	1½
Quicksilver, pf.	1½
Ray Con.	25½
Republic I.&S.,com.	84
Republic I. & S., pf.	100½
Sloss-Sheffield	47
Tennessee C. & C.	15½
U. S. Steel, com.	112½
U. S. Steel, pf.	117
Utah Copper	95½
Va. Iron C. & C.	60

N. Y. CURB†	Sept. 25
Big Ledge	1½
Butte & N. Y.	1½
Butte C. & Z.	9
Caledonia	.75
Calumet & Jerome	2 3/16
Can. Cop. Corpn.	2½
Carlisle	4
Cashboy	.06½
Con. Ariz. Sm.	2 3/16
Con. Coppermines	10
Con. Nev.-Utah	12½
Emma Con.	⅞
First Nat. Cop.	2½
Goldfield Con.	.38
Goldfield Merger	.05
Greenmonster	⅞
Hecla Min.	8½
Howe Sound	5½
Jerome Verde	1½
Kerr Lake	6½
Louisiana	.87½
Magma	52
Majestic	.38
McKinley-Dar-Sa.	.69
Milford	1½
Mohican	⅝
Mother Lode	.38
N. Y. & Hond.	13½
Nipissing Mines	9½
Ohio Cop.	1 3/16
Ray Hercules	3½
Richmond	⅛
Rochester Mines	.52
St. Joseph Lead	18
Standard S. L.	¼
Stewart	1 3/16
Success	.20
Tonopah	6½
Tonopah Ex.	2 3/16
Tribullion	.15
Troy Arizona	.16
United Cop.	.75
United Verde Ext.	36½
United Zinc	4
Utica Mines	.25
White Knob, pf.	‡1½
Yukon Gold	2

SAN FRAN.*	Sept. 25
Alta	.04
Andes	.12
Best & Belcher	.03
Bullion	.02
Caledonia	.10
Challenge Con.	.01
Confidence	.05
Con. Virginia	.20
Gould & Curry	.01
Hale & Norcross	.03
Jacket-Cr. Pt.	.08
Mexican	.09
Occidental	.60
Ophir	.09
Overman	.05
Savage	.03
Seg Belcher	.02
Sierra Nevada	.18
Union Con.	.65
Utah Con.	.01
Belmont	4.37½
Jim Butler	.01
MacNamara	.22
Midway	.12
Mont.-Tonopah	.19
North Star	.09
Rescue Eula	.18
West End Con.	.71
Atlanta	.09
Booth	.05
Comb. Frac.	.03
D'field Daisy	.03
Florence	.10
Jumbo Extension	.19
Kewanas	.09
Nevada Hills	.12
Nevada Packard	.23
Round Mountain	.25
Silver Pick	.08
White Caps	1.45
Big Jim	‡.69
United Eastern	4.20

BOSTON EXCH.*	Sept. 25
Adventure	1¼
Ahmeek	97
Algomah	.45
Allouez	63
Ariz. Com., ctfs.	11
Arnold	.25
Bonanza	.21
Butte-Balaklava	.40
Calumet & Ariz.	78
Calumet & Hecla	530
Centennial	16
Copper Range	56½
Daly West	2½
Davis-Daly	4½
East Butte	11½
Franklin	6
Granby	80
Hancock	13
Hedley	‡17
Helvetia	.25
Indiana	1½
Isle Royale	31
Keweenaw	1¼
Lake	10
La Salle	3
Mason Valley	6½
Mass	10½
Mayflower	1½
Michigan	1½
Mohawk	82½
New Arcadian	3
New Idria	12
North Butte	16½
North Lake	.95
Ojibway	1½
Old Dominion	48½
Osceola	88
Quincy	83
St. Mary's M. L.	70
Santa Fe	1 7/16
Seneca	7
Shannon	7
Shattuck-Ariz.	24
So. Lake	3
So. Utah	.15
Superior	7½
Superior & Bost.	3¾
Trinity	5½
Tuolumne	1½
U. S. Smelting	65
U. S. Smelt'g, pf.	49½
Utah Apex	3½
Utah Con.	15
Utah Metal	3½
Victoria	3½
Winona	2½
Wolverine	41
Wyandot	.80

BOSTON CURB*	Sept. 25
Alaska Mines Corp.	.37
Bingham Mines	11½
Boston Ely	.50
Boston & Mont.	.64
Butte & Lon'n Dev.	.13
Calaveras	2½
Calumet-Corbin	.01
Chief Con.	2½
Cortez	.10
Crown Reserve	.26
Crystal Cop.	.80
Eagle & Blue Bell	2½
Houghton Copper	.75
Intermountain	1½
Iron Cap, Com.	17½
Iron Cap Cop., pf.	17½
Mexican Metals	.26
Mines of America	1½
Mojave Tungsten	.44
Nat. Zinc & Lead	.40
Nevada-Douglas	1½
New Baltic	1½
New Cornelia	16½
Oneco	.35
Pacific Mines	.35
Rex Cons.	.15

SALT LAKE*	Sept. 24
Bannack	.26
Big Four	.00½
Cardiff	4.00
Colorado Mining	.15
Daly	1.70
Daly-Judge	8.45
Empire Copper	1.27½
Gold Chain	.16
Grand Central	.52
Iron Blossom	.89
Lower Mammoth	.03
May Day	.04½
Moscow	.11
Prince Con.	.98
Silver-King Coal'n.	3.15
Silver King Con.	4.20
Sioux Con.	.06
So. Hecla	.97½
Tintic Standard	1.47½
Uncle Sam	.04
Wilbert	.27
Yankee	.06½

TORONTO*	Sept. 24
Bailey	.05
Beaver Con.	.40
Buffalo Mines	‡1.00
Chambers Ferland	.15
Coniagas	3.80
Hargraves	.14
La Rose	.62½
Peterson Lake	.11½
Right of Way	‡.05
Temiskaming	.35
Wettlaufer-Lor.	.07
Dome Exten.	.15
Dome Lake	.14
Foley O'Brien	‡.60
Hollinger	5.10
McIntyre	1.46
Newray	.70
Porcu. Crown	.40
Schumacher	‡.42
Teck-Hughes	.40
Vipond	.26
West Dome	.17

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Sept. 25
Cresson Con.	5.62½
Doctor Jack Pot.	.04½
Elkton Con.	.04½
El Paso	.20
Gold Sovereign	.03½
Golden Cycle	1.99
Granite	.44
Isabella	.08½
Mary McKinney	.07½
Portland	1.41
United Gold M.	.16½
Vindicator	.68

LONDON	Sept. 19		
Alaska Mexican	£0	5s	0d
Alaska Tre'dwell	1	0	0
Burma Corp.	3	19	4½
Cam & Motor	0	11	0
Camp Bird	0	8	0
El Oro	0	11	0
Esperanza	0	10	6
Mexican Mines	6	0	0
Nechi, pfd.	0	13	3
Oroville	0	17	6
Santa Gert'dis.	0	12	0
Tomboy	0	18	0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1915	1916	1917	1915	1916	1917
January	48.855	56.775	75.630	22.731	26.960	36.682
February	48.477	56.755	77.585	22.753	26.975	37.742
March	50.241	57.935	73.861	23.708	27.597	36.410
April	50.250	64.415	73.875	23.709	30.662	36.963
May	49.915	74.269	74.745	23.570	35.477	37.940
June	49.034	65.024	76.971	23.267	31.060	39.065
July	47.519	62.940	79.010	22.597	30.000	40.110
August	47.163	66.083	85.407	22.780	31.498	43.418
September	48.680	68.515	.....	23.591	32.584	.....
October	49.385	67.855	.....	23.925	32.361	.....
November	51.714	71.604	.....	25.094	34.192	.....
December	54.971	75.765	.....	26.373	36.410	.....
Year	49.684	65.661	.....	23.675	31.315	.....

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1916	1917	1916	1917	1916	1917
Jan.	24.008	28.673	88.083	131.921	116.167	142.895
Feb.	26.440	31.750	102.667	137.895	133.167	148.100
Mar.	26.310	31.481	107.714	136.750	136.000	151.000
April	27.895	27.935	124.319	133.842	137.389	147.158
May	28.625	28.788	135.457	130.000	152.522	142.000
June	26.601	29.962	112.432	130.000	137.455	142.000
July	23.865	26.620	95.119	128.409	125.500	140.409
Aug.	26.120	25.380	110.283	122.391	126.304	137.000
Sept.	26.855	.....	113.905	.....	134.071	.....
Oct.	27.193	.....	122.750	.....	142.523	.....
Nov.	30.625	.....	134.659	.....	155.432	.....
Dec.	31.890	.....	145.316	.....	162.842	.....
Year	27.202	.....	116.059	.....	138.281	.....

Tin	New York		London	
	1916	1917	1916	1917
January	41.825	44.175	175.548	185.813
February	42.717	51.420	181.107	198.974
March	50.741	54.388	193.609	207.443
April	51.230	55.910	199.736	220.171
May	49.125	63.173	196.511	245.114
June	42.231	62.053	179.466	242.083
July	38.510	62.570	168.357	242.181
August	38.565	62.681	169.870	243.978
September	38.830	.....	171.345	.....
October	41.241	.....	179.307	.....
November	44.109	.....	186.932	.....
December	42.635	.....	183.368	.....
Av. year	43.480	.....	182.096	.....

Lead	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
January	5.921	7.626	5.826	7.530	31.167	30.500
February	6.246	8.636	6.164	8.595	31.988	30.500
March	7.136	9.199	7.375	9.120	34.440	30.500
April	7.630	9.288	7.655	9.158	34.368	30.500
May	7.463	10.207	7.332	10.202	32.967	30.500
June	6.936	11.171	6.749	11.123	31.011	30.500
July	6.352	10.710	6.185	10.644	28.137	30.500
August	6.244	10.594	6.088	10.518	29.734	30.500
September	6.810	.....	6.699	.....	30.786	.....
October	7.000	.....	6.898	.....	30.716	.....
November	7.042	.....	6.945	.....	30.500	.....
December	7.513	.....	7.405	.....	30.500	.....
Year	6.853	.....	6.777	.....	31.359	.....

Spelter	New York		St. Louis		London	
	1916	1917	1916	1917	1916	1917
Jan.	16.915	9.619	16.745	9.449	89.810	48.329
Feb.	18.420	10.045	18.260	9.875	97.762	47.000
Mar.	16.846	10.306	16.676	10.136	95.048	47.000
April	16.695	9.459	16.525	9.289	99.056	54.632
May	14.276	9.362	14.106	9.192	94.217	54.000
June	11.752	9.371	11.582	9.201	68.591	54.000
July	8.925	8.643	8.755	8.473	50.750	54.000
Aug.	8.730	8.360	8.560	8.190	51.587	54.000
Sept.	8.990	.....	8.820	.....	52.095	.....
Oct.	9.829	.....	9.659	.....	54.159	.....
Nov.	11.592	.....	11.422	.....	56.023	.....
Dec.	10.665	.....	10.495	.....	55.842	.....
Year	12.804	.....	12.634	.....	72.071	.....

New York and St. Louis quotations, cents per pound, London, pounds sterling per long ton.

Pig Iron, Pitts.	Bessemer‡		Basic‡		No. 2 Foundry	
	1916	1917	1916	1917	1916	1917
January	$21.60	$35.95	$18.78	$30.95	$19.70	$30.95
February	21.16	36.37	18.93	30.95	19.51	30.95
March	21.81	37.37	19.20	33.49	19.45	35.91
April	21.65	42.23	18.95	38.90	19.45	40.06
May	21.78	46.94	19.11	42.84	19.58	43.60
June	21.95	54.22	18.95	50.05	19.34	50.14
July	21.95	57.45	18.95	53.80	19.20	53.95
August	21.95	54.17	18.95	50.37	19.22	53.95
September	22.88	.....	19.58	.....	19.53	.....
October	24.61	.....	21.26	.....	21.51	.....
November	30.07	.....	28.18	.....	26.55	.....
December	35.16	.....	30.95	.....	30.79	.....
Year	$23.88	.....	$20.98	.....	$21.15	.....

‡ As reported by W. P. Snyder & Co.